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PSYCHOLOGICAL ANALYSES OF COURAGEOUS PERFORMANCE IN MILITARY PERSONNEL

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Four studies were carried out to examine several aspects of courageous military performance. Paratroop veterans showed the low responsiveness under stress that is characteristic of "fearless" bomb-disposal operators. A long-term prospective study of new and experienced bomb-disposal operators is underway. Recruits to parachute training were found to perform successfully, and 3 patterns of behavior were identified by cluster analysis: courageous performance (66% of sample of 105), fearless performance (26%), and overconfident performance (7%). A predictive study of parachute training is underway.

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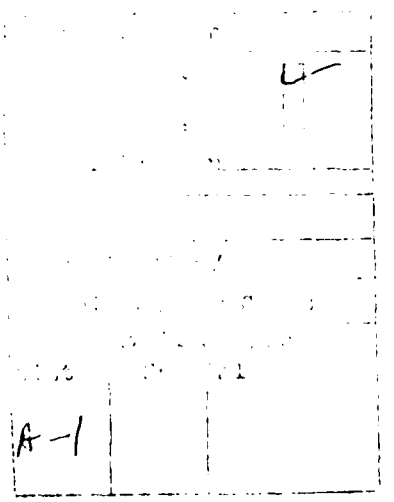

PSYCHOLOGICAL ANALYSES OF COURAGEOUS PERFORMANCE

FINAL TECHNICAL REPORT (APRIL 1986)

INTRODUCTION

The results of previous research on the subject of fear and courage, reported in the First Project, drew attention to the crucial role of training in preparing bomb-disposal operators to perform fearlessly. In addition to their lengthy training as ordnance soldiers, bomb-disposal operators undergo a two month course of specialized lectures and demonstrations, followed by a three week course of supervised practical training. They are required to render safe a range of devices under realistic simulations based on recent incidents in Northern Ireland. Two separate investigations produced evidence of a small group of exceptionally fearless soldiers. It became desirable to expand this research in order to ascertain the extent to which the findings can be generalised to other groups of soldiers, and also to intensify the study of these fearless soldiers.

In this second stage, four studies were planned: Firstly, a prospective study of the performance of bomb-disposal operators on active duty; secondly, an attempt to assess the generality of our earlier findings on the role of training in the development of courageous and fearless performance; thirdly, a psychophysiological analysis of performance under a laboratory stress, expanded to include a fresh sample of military personnel; fourthly, an attempt to predict success/failure in stressful military training.

BACKGROUND

The resilience of human beings has been overlooked and as a result, most of the prevailing theories of fear must now be regarded as inadequate (Janis, 1951; Rachman, 1978; Singer, 1981). New analyses and new research are required on this problem and on the nature of courage.

Fearlessness is often regarded as being synonymous with courage, but there is some value in distinguishing this viewpoint from a more elaborate perspective, outlined below. There are several meanings of fear, and similarly, different types of courage. As well as fearlessness (the absence of fear), we can recognise the occurrence of

perseverence despite fear. One could in fact argue that it is this latter type of conduct that is the purest form of courage. It certainly requires greater endurance and effort.

In order to discuss the attributes of courage, one must specify what is meant by fear, but it is no longer sufficient to argue for a single index of, or composite entity of, fear. As argued persuasively in the writings of Lang (1970), "fear is not some hard phenomenal lump that lives inside people, that we may palpate more or less successfully". He proposed instead that we view fear as comprising three major components - subjective, behavioral and physiological. These three major components of fear are related to each other, but only in an imperfect manner; they are partially independent (Grey, Sartory and Rachman, 1980).

Pursing this new view of fear, as a complex of imperfectly related components, leads to fresh ideas on the nature of courage. A person may be willing to approach a frightening object or situation but experience a high degree of subjective fear and even some unpleasant bodily reactions. Persistence in the face of these subjective and physical signs of fear is the sort of courage exhibited by many patients. We can now describe this type of courageous behavior as an example of the uncoupling of three major components of fear, in which the person's overt behavior has advanced beyond his subjective discomfort. People who continue to approach the fearful situation without experiencing either subjective fear or unpleasant bodily reactions are showing a pattern which is more accurately described as being fearless rather than courageous.

These observations, research data from laboratory and clinic on the conditioning and weakening of the components of fear, and findings from the literature on military psychology and civilian war-time experiences, have led me to develop a fresh analysis of courage (Rachman, 1978). A significant feature of this emerging theory is the view that the following factors are postulated to increase courageous behavior: (a) skill and competence, (b) positive motivation, (c) courageous models, (d) repeated coping practice, (e) self-confidence and (f) situational demands (Gal, 1980).

Although the arguments and evidence presented in Rachman (1978) will not be repeated here, some examples may be helpful. For example, although fear reactions during or immediately after stress are common, as in air raids, we apparently have the capacity to recover very quickly. Moreover, we have good powers of adaptation to repeated stress and dangers. During air raids, people who were given socially responsible tasks to carry out, experienced a growth of courage. Furthermore, it was found that people adapted to air raids and became more courageous with increasing experience - even when, as in London, the raids became progressively heavier.

With respect to the factors which promote courage, newly developed procedures for improving ineffective behaviour that is caused by fear have yielded clear evidence of the value of coping models (e.g. Bandura and Adams, 1978) in generating fear-reducing behavior. People learn from fearless models how to deal with stressful or dangerous situations. Evidence on the courage-inducing value of positive motivation is derived from the literature on military psychology (e.g. Lewis and Engle, 1952). Military surveys also suggest that adequate training and the accompanying sense of competence and self-confidence are important determinants of courageous behaviour in combat conditions, and our observations of bomb-disposal officers bear this out (see Reports on First Project). Military evidence, drawn mainly from experience in the Second World War, seems to point consistently towards the proposition that there are in the population numbers of people who are unusually resistant to the acquisition of fear. In some respects these people appear to resemble those whom Garmezy (1976) has referred to "invulnerables". The results of the First Project produced two new pieces of evidence in support of this idea.

Military personnel who are particularly resilient when placed in stressful circumstances are of special interest to researchers who seek to understand the origins and nature of courage. In a war-time study of air crews drawn from the 8th U.S.A.A.F., Hastings, Wright and Glueck (1944) reported on 150 airmen who were particularly successful. Contrary to what had been expected, they found that nearly half of these successful fliers had family histories with emotional instability. Despite this, their life patterns were not marked by social acts but were characterised by "vigour, persistence and physical health". In

the First Project, summarised below, we found that successful (decorated) operators could be distinguished from average operators on the basis of personality characteristics assessed prior to their tour of duty. The former, exceptional group, were particularly calm and clear thinking and not concerned with bodily reactions. In the stress experiment, the decorated operators showed negligible physiological signs of disturbance, relative to successful non-decorated operators or civilians (see also the work of Fenz and Jones, 1972). Apart from the extensive training and preparation which goes in to creating a courageous soldier, it seems possible that exceptional performance under hazardous conditions can be predicted from personality characteristics and/or psychophysiological stability.

EARLIER RESEARCH

The First Project, conducted on bomb-disposal operators, yielded a number of interesting and potentially valuable findings. These include:- confirmation of the significant psychological effects of the training procedures, the cumulative effects of active duty on levels of confidence and skill, the psychological differences between experienced and inexperienced operators, the psychological problems that arise during the tour, the after-effects of a tour of active duty, and so on. In addition, we determined that most operators performed fearlessly on virtually all combat missions, and that during the 4-month tour of duty their mood states were stable. A psychometric analysis of a group of operators who received decorations for gallantry revealed some differences in personality between these soldiers and another highly competent group of operators. The probability that there is a small group of soldiers who are especially capable of carrying out dangerous tasks fearlessly, was strengthened by a psychophysiological study of reactions to stress.

We found some (physiological) differences between decorated operators and non-decorated operators, who were in turn less reactive to stress than civilian control subjects. The potential importance of this group of soldiers, who are physiologically low reactors and unusually healthy, is considerable. Confirmation of the existence of such a group of especially fearless soldiers would allow us to develop methods for identifying these people in advance, and perhaps choosing them for the commission of particularly hazardous missions.

The development of reliable assessment procedures for these soldiers would also put us in a position to monitor the success or otherwise of training techniques designed to increase fearlessness in other groups of soldiers. Suitable assessment procedures should enable us to predict military performance, and conceivably this would include the prediction of possible failure.

In research carried out on psychiatric samples, we have found that people whose subjective reports of fearlessness are discordant with their highly reactive physiological systems, are most likely to break down. These findings and procedures can be introduced into the planned predictive studies. As a general aim, we need to determine how far our findings on the courageous/fearless performances of the bomb disposal operators apply to other military units.

PUBLICATIONS ARISING OUT OF PROJECT

Cox, D. and Rachman, S.J. (1983) Performance under operational conditions. Advances in Behav. Res. Ther., 4, 127-153.

Cox, D., Hallam, R. and Rachman, S. (1983) An experimental analysis of fearlessness and courage. Brit. J. Psychology, 74, 107-117.

Hallam, R.S. (1983) Fear and courage among military bomb-disposal operators: psychometric analysis. Advances in Beh. Res. Ther., 4, 105-120.

Hallam, R.S., and Rachman, S. (1980) Courageous acts or courageous actors? Personality & Individual Differences, 1, 341-360.

Hallam, R. and Rachman, S. (1983) Psychological effects of a training course. Advances in Behav. Res. Ther., 4, 127-153.

McMillan, T.M. and Rachman, S.J. Fearlessness and courage: A laboratory study of paratrooper veterans of the Falklands War (submitted for publication).

O'Connor, K., Hallam, R. and Rachman, S. (1985) Fearlessness and courage. Brit. J. Psychology, 76, 187-197.

Rachman, S.J. (1978) Fear and Courage. San Francisco: W.H. Freeman.

Rachman, S.J. (Ed.) (1983) Fear and courage in bomb disposal operators. Advances in Behav. Res. Ther, 4, 99-164.

Rachman, S. (1982) Fear and courage: Military aspects. Journal Royal Army Medical Corps, 128, 100-104.

Rachman, S. (1984) Anxiety: Emerging theories. J. Behav. Assess., 6, 281-299.

Rachman, S.J. and Levitt, K. (1985) Panic and its consequences. Behav. Res. Ther., 23, 585-600.

Rachman, S.J. (1983a) Fear and fearlessness in trainee parachutists. Advances in Behav. Res. Ther., 4, 153-160.

McMillan, T.M. & Rachman S. Fearlessness - courage in parachute trainees. In preparation, 1986.

TECHNICAL OBJECTIVES

The general purpose of the present project was to study the development of courage through training to performance, and to study the qualities of courageous individuals. The four studies consisted of the following:-

1. A prospective study of bomb-disposal operators' performance on tour in Northern Ireland.

2. The extension of the psychophysiological study of stress to include veterans of infantry combat.

3. The study of the training of novice paratroopers.

4. The prediction of success and failure in paratrooper training (in a separate study).

ABBREVIATIONS

Military

AT	ammunition technician
ATO	ammunition technician officer
EO	experienced officer
EOD	explosive ordinance device
IED	improvised explosive device
IED	inexperienced officer
IO2	inexperienced officer with previous non-IED military experience in Northern Ireland
IO2	inexperienced officer without previous experience in N.I.
NCO	non-commissioned officer
NI	Northern Ireland
RAOC	Royal Army Ordinance Corps.
RSP	rendered safe procedure

Psychological

ACL	Mood adjective checklist
ANOVA	analysis of variance (a statistical technique)
BSQ	bodily sensations questionnaire
CA	cluster analysis
CAQ	clinical analysis questionnaire
CS	conditioned stimulus
EPI	Eysenck personality inventory
FSQ	fear survey schedule
HR	heart rate
IBI	inter-beat interval
N	number of subjects
NS	not statistically significant
p	probability
PCA	principal components analysis
RAQ	retrospective anxiety questionnaire
SD	standard deviation
SPQ	sensation perception questionnaire
UCS	unconditioned stimulus

>	greater than
<	less than

Study I A Laboratory Study of Responses to Stress in Decorated and Non-Decorated Paratrooper Veterans of the Falklands War

A Laboratory Study of Responses to Stress in Decorated and Non-Decorated Paratrooper Veterans of the Falklands War

INTRODUCTION

A distinctive pattern of cardiac response was found in bomb disposal operators undergoing a laboratory stress test which involves auditory discrimination under threat of electric shock (Cox, Hallam, O'Connor and Rachman, 1983). This result has recently been replicated, again in bomb disposal personnel (O'Connor, Hallam and Rachman, 1985). In both of these studies bomb disposal operators who had been decorated for gallantry on duty in Northern Ireland showed lower cardiac responses under a difficult discrimination condition when compared to equally experienced and successful operators who had not been decorated. These groups were also compared on subjective questionnaire reports of anxiety experienced during the laboratory test but consistent differences were not found.

In an attempt to investigate whether or not these findings generalise to a different group of soldiers, the study was repeated on members of the Parachute Regiment who also were veterans of the Falklands War.

As physical fitness can reduce cardiac response to stress (Biersner et al. 1977; Cox et al. 1979; Sinyor et al. (1983) we also tested the hypothesis that heart rate during stress is lower in fitter individuals.

Experimental Design: The aim of this study was to examine differences in cardiac response and on subjective anxiety between decorated and non-decorated veterans of the Falklands War. They underwent a laboratory stress test that involves difficult auditory discriminations under threat of electric shock, using a standard procedure that allows a comparison between these new findings with those previously obtained from the bomb disposal operators who had been on tour in Northern Ireland.

The study was designed to closely replicate the study of O'Connor et al. (1985). The notable difference in design was the incorporation of a test of physical fitness. However as this took place following the laboratory stress test it was unlikely to affect the validity of the replication.

Subjects: Thirty-four Falklands veterans participated in the study. They were members of the 2nd Battalion of the Parachute Regiment. Sixteen of these soldiers had been decorated, either for a particular act of bravery or for generally outstanding behaviour while on active service in the Falklands. Decorated and non-decorated veterans attended testing sessions in a random order. The average age of decorated veterans was 27.6 $\pm$ 5.57 years (mean $\pm$ standard deviation) and was 23.89 $\pm$ 4.21 years in non-decorated soldiers; this difference was non-significant ($df = 32$, $t = 1.89$, $p < 0.07$).

Method: This study took place two years after the Falklands war. The experiment was carried out in three phases: (1) Six presentations of 2 auditory stimuli, followed by (2) presentation of an unavoidable shock paired with auditory tones, and (3) the subjects being then required to make a discrimnative avoidance response in order to avoid further shocks.

The auditory stimuli were tones in the range of 400 to 600 Hz, set at a level of 60 dB, transmitted for 1 sec binaurally through earphones from a commercial oscillator. The unconditioned stimulus was a shock administered from a battery-powered shock box through silver electrodes attached to the ventral phalanx above the last 2 fingers of the left hand. In order to avoid the electric shock during the third phase of the experiment, the subjects had to move a lever to the left or the right. Throughout all the phases of the experiment, cardiac responses were measured by a photoelectric plethysmograph (fed through a Grass preamplifier, T.C.0.1sec.) attached to an earlobe, and the data recorded onto analogue tape. A micro-computer controlled the presentation of all stimuli, and the interval between the conditioned stimulus and the unconditioned stimulus was set at 6 secs. During the discrimination phase, the micro-computer monitored the lever voltage level which triggered the shock relay whenever an incorrect response was made.

The subject's behavioural response was made by moving a lever that was mounted on a stand at knee level in front of the subject. In order to indicate his judgement of whether the tone was high or low, the subject moved the lever with his preferred hand from an upright position, fully

over either to the right or the left after hearing the tone. The subject was instructed to wait for a few seconds and then return the lever to the central position, ready for the next trial. The lever was an extension of a potentiometer, which was connected to the input of the micro-computer. The correct right or left response was converted to a positive or negative criterion voltage level, which determined shock administration accordingly for each trial. For the discrimination condition, the presence of a shock marker was an indication of unsuccessful performance.

Procedure: Prior to participating in the experimental stress test, each subject filled in two questionnaires: a Bodily Sensation Questionnaire (BSQ) adapted from Borkovec (1976), and a self-rated Retrospective Anxiety Questionaire (RAQ). This questionnaire had a scale of 0 to 100 where 0 = totally calm and 100 = maximum level of anxiety. The questionnaire items related to 8 points in the period surrounding the experimental stress test: receiving the request to attend the experiment, arranging a specific appointment, the morning of the appointment, immediately after the stress test, during the unavoidable shock, after learning how to avoid shock with a lever, during the difficult final phase, immediately after the stress test has finished. The reports of how they felt during the stress test were completed retrospectively, i.e. immediately after the test session had been concluded.

After the subjects had completed the initial psychometric tests, and the nature of the test was explained to them, they were seated in the experimental room. They were told that the experiment was designed to examine reactions to stress and that it would involve the administration of several electric shocks. The subjects' level of shock tolerance was then determined by the administration of brief shocks of increasing strength until a level was obtained for each person which was uncomfortable without being extremely painful.

During the first phase of the stress test, the subjects were asked to sit and listen to the presentation of a series of high and low tones which could be heard through the earphones. In this phase of six trials, they were not required to make any responses and were told that they would receive no shocks.

During the second phase, both high (600 Hz) and low (400 Hz) tones were each presented on three occasions, but this time they were followed 6 secs later by the delivery of an electric shock, about which the subjects had been forewarned. On these six trials, the shock was unavoidable. In the final third phase, the CS and the shock were again paired, but the subjects were now able to avoid the shock by moving the lever in one direction for the high tones and in the opposite direction for the low tone. Each subject had to discover through trial and error the correct direction for the two tones. The subjects had 6 secs in which to move the lever before the shock was delivered. If they made an incorrect decision or if they exceeded the 6 sec time interval, they received a shock.

During this final phase of the stress test, four sets of six trials each were administred in turn. In the first six trials, the tones were set at easily discriminable differences (600Hz and 400Hz). Over the following three sets of trials however, the discrimination became much more difficult because the lower tone was made progressively higher, changing from 400 to 550, 590, and finally to 600Hz. In the last set of six trials, there was of course no difference between the tones stimuli; i.e. it was an insoluble conflict.

All phases of the experiment were administered to each subject in a single testing session, which lasted for approximately 1 hour. Subjects were instructed that they could end the experiment at any time if they so wished, but all of them completed the full session.

Physical fitness can reduce cardiac effects of stressors (Biersner et al. 1977; Cox et al. 1979; Sinyor et al. 1983). Hence an estimate of physical fitness was made in all subjects in case any differences in heart rate response to stress are mediated by fitness. After the laboratory stress test each subject was asked to complete a three minute one-step test, in which a high step was mounted 90 times. A regular pace was kept by transmission of a tone at one sec intervals. Initially the subject sat at rest for 5 mins before completing the 3 minute step test and subsequently recovery of pulse rate was monitored for 3 minutes, once more whilst seated at rest.

After the completion of the laboratory tests, subjects were asked to fill in questionnaires once more in order to assess their subjective reactions to the test situation. The Bodily Sensation Questionnaire was completed according to how subjects felt during the most difficult discrimination trials in the final phase of the experiment. The Retrospective Anxiety Questionnaire was used to learn how subjects had felt during the test session itself (See Figure II).

Results:

a) Physiological Responses: The physiological data from 13 decorated and 16 non-decorated veterans was analysed by micro-computer. Data from the 5 remaining soldiers could not analysed because of interference on the recording trace.

Cardiac activity was measured in terms of heart rate (HR). The number of beats/minute was estimated by scoring the conditioned stimulus-unconditioned stimulus stress interval i.e. from HR data collected 6 secs after the onset of the tone in each trial.

The differences between decorated and non-decorated Falklands veterans were non-significant for any of the six phases of the test (see Table I, Figure 1). Multivariate analysis of variance did not reveal significant differences between groups over the six phases of the test ($F(1.5) = 0.5$, $p > 0.05$).

Analysis of change scores was undertaken to take into account initial heart rates between groups. In order to obtain change scores HR in the baseline "tones only" condition was subtracted from HR in each subsequent phase of the experiment. Changes in HR between decorated and non-decorated groups were all however found to be non-significant by t-test ($p > 0.05$).

b) Questionnaire Reports: Results from subjective questionnaire ratings are given in Table II. General feelings of anxiety at various points during the experiment (Figure 2) did not differ between decorated and non-decorated soldiers ($p > 0.05$). More specific perception of bodily reactions associated with stress and anxiety (Bodily Sensation Questionnaire) similarly did not differ between groups, nor were the differences between expected (pre-test) and experienced (post-jump) bodily sensations significantly different (see Table II).

c) Physical Fitness: Resting pulse rate was estimated following the laboratory stress test while the subject was at rest and told to relax. The subject subsequently underwent 3 mins of moderate exercise during which, pulse rate was measured at 1 min intervals and similarly, recovery was measured at rest over 3 mins. The results are shown in Table III. It can be seen that resting pulse rate and recovery following exercise were not different between groups. Pulse rate was higher in the decorated soldiers during exercise ($p < 0.01$). However this is not normally taken to be the best indicator of fitness because maximum pulse rate varies little despite training to improve fitness, and is affected by extraneous factors such as age (Hull et al. 1984). The groups did not differ significantly with respect to the time spent exercising or frequency of exercise/week.

The measures of physical fitness were found to intercorrelate. Recovery of pulse rate following exercise correlated significantly with the weekly frequency of exercise ($r = -0.38$; $p < 0.02$) and also with resting pulse rate ($r = 0.70$; $p < 0.001$) and maximum pulse rate during exercise ($r = 0.43$; $p < 0.01$).

Table IV shows correlations between measures of physical fitness, and the cardiac responsiveness during the laboratory stress test in decorated and non-decorated Falklands veterans which were combined to form a single group. Greater cardiac responsiveness during the laboratory stress test was associated with reduced recovery of pulse rate in the three minutes following the fitness test and also with higher pulse rates during exercise. However, the correlations were not significant for the stress conditions alone and changes in pulse rate from the "tones only" condition did not in fact correlate significantly with fitness measures ($p > 0.05$). Hence the findings presented in Table IV are more likely to be due to differences in resting pulse rate rather than stress response.

d) Comparison Between Falklands Veterans and Bomb Disposal Operators:

(i) Physiological Responses: The experimental procedures and laboratory equipment used in this study were virtually identical to those described by O'Connor et al. (1985). Hence it is argued that a direct comparison between these two studies is valid. The only notable difference between these studies was the inclusion of the physical

fitness test after the laboratory stress investigation in the present investigation.

As the differences between the decorated and non-decorated Falklands veterans were non-significant, the two groups were combined to form a single group of n = 29. The results from the Falklands veterans were then compared to the data collected from the decorated (n = 8) and non-decorated (n = 8) bomb disposal operators who took part in the O'Connor et al. (1985) study.

Multivariate analysis of variance between these three groups revealed no significant differences overall between groups (df 2,42, F = 1.34, $p > 0.05$). However, there was a highly significant interaction between groups over test conditions ($F(10) = 3.52$, $p < 0.001$).1 It can be seen that although the HR responses of the Falkland Veterans were initially similar to those of the non-decorated bomb disposal operators, their cardiac responses under stress were more similar to those of the decorated operators (see Figure 3).

O'Connor et al. (1985) reported lower cardiac responsiveness to stress in decorated bomb disposal operators during the most difficult discrimination between tones ($p < 0.05$). Similarly t-tests between the Falkland Veterans and the non-decorated bomb disposal operators revealed significant differences for HR only during the most difficult discrimination ($t(35) = 2.36$; $p < 0.05$). With regard to the groups x condition interaction, the most crucial part of the pattern is during the trials where stress was greatest. However, multivariate analysis of variance over the last three conditions (600Hz vs 550, 590 and 600Hz) did not show a significant interaction ($F(5) = 2.19$; $p < 0.08$), suggesting that the overall effect is at least partly due to preliminary, baseline and habituation phases of the test. As the initial HR responses in the "tones only" condition varied markedly (figure 3), further analysis was carried out to clarify the differences that were found.

The initial "tones only" condition can be considered as a neutral baseline for heart rate as the tones were not in themselves reported to be aversive. To account for the influence of initial differences in heart rate between groups, change scores were computed by subtracting HR in the "tones only" condition from HR in subsequent phases of the

experiment, as previously described. Table V shows means and standard deviations for the change scores. Multivariate analysis of variance once more revealed a highly significant difference between groups (df 2,42; $F = 10.35$, $p < 0.001$). The interaction between groups and conditions was also significant ($F = 2.78$, $p < 0.01$). Figure 4 shows that the differences between the groups can be traced to the low cardiac rsponsiveness in the Falkland Veterans. In contrast there was notable reactivity in the bomb disposal operators. A more detailed analysis of this group effect was carried out using t-tests between pairs of groups for each test phase (Table V). Differences in change scores were not found between bomb disposal groups for any phase ($p > 0.05$). Falklands veterans had lower cardiac reactivity throughout the experiment when compared to the decorated bomb disposal personnel (Table V). Comparison of Falklands veterans with non-decorated bomb disposal soldiers also revealed significant differences except during the "tones and shock" condition (Table V).

A significant quadratic effect was found over conditions for change scores (df 1,39; $F = 9.53$, $p < 0.001$). This means that although the degree of change in HR differed between groups, the overall pattern of cardiac responsiveness was similar.

(ii) Questionnaire Reports: The differences between the groups were examined using one-way analysis of variance (see Table VI). The BSQ revealed pre-test differences between groups ($p < 0.001$). This was due to lower frequencies and numbers of bodily reactions experienced among the Falklands veterans. Retrospective BSQ ratings of sensations experienced during the most difficult tone discrimination condition did not show any differences between the groups ($p > 0.05$).

With regard to RAQ ratings, lower anxiety was reported by the Falklands veterans "just before the test" ($p < 0.05$) and "during unavoidable shock" ($p < 0.01$). Decorated bomb disposal operators reported higher anxiety levels than other groups "earlier than am" ($p < 0.03$). Lower retrospective accounts of anxiety was also found in Falklands veterans during the most difficult discrimination phase when compared to the average of combined bomb disposal groups ($t = 2.94$, $p < 0.005$).

(iii) Behaviour Responses: The average number of shocks received by the Falklands veterans were compared with those received by decorated and non-decorated bomb disposal operators (Table VII), and were not found to differ between groups ($p > 0.05$).

Discussion:

The principal aim of this study was to determine whether or not responses to laboratory-induced stress differed between decorated and non-decorated members of the Parachute Regiment who were veterans of the Falklands War. It is clear that the decorated and non-decorated veterans could not be distinguished either in terms of cardiac responsiveness or by subjective questionnaire ratings. These results did not replicate the lower HR found in decorated bomb disposal operators (Cox et al., 1983; O'Connor et al., 1985) during the most difficult discrimination between tones.

The absence of any differences in heart rate between decorated and non-decorated Falklands Veterans could be due to their lower responsiveness overall, perhaps producing a "floor" effect in contrast to the bomb disposal operators. This view arises from the small changes of $\pm$ 2 beats/minute in the paratrooper veterans compared to the increases of up to 12 beats/minute in the bomb disposal operators (Figure 4). Despite the low responsiveness, the pattern of cardiac reaction over the difference phases of the experiment was similar to that reported by O'Conner et al. (1985) and this is substantiated by the highly significant quadratic effect ($p < 0.001$). A tendency for heart rate to increase maximally when the rule governing shock avoidance was being learnt (600 vs 400 Hz discrimination) was found in both groups of bomb disposal operators by O'Connor et al. (1985) and in paratrooper veterans investigated here. In addition a tendency towards subsequent deceleration of HR found in decorated operators, was also found in paratroopers if to a less marked extent, (see Figure 3). Furthermore, a similar number of shocks were received by paratrooper and EOD soldiers, suggesting similar levels of shock avoidance learning.

A relative absence of cardiac responsiveness in a seemingly stressful situation is consistent with Rachman's (1983) definition of fearlessness. However, subjective ratings of anxiety increased during the experiment indicating desynchrony between perceived anxiety and cardiac

responding. Paratrooper veterans tended to experience fewer and less severe bodily reactions immediately before the experiment than did bomb disposal operators, but nevertheless perceived a similar number and severity of bodily reactions during the laboratory test. However ratings of anxiety just prior to the test and during unavoidable shock were lower in the paratrooper veterans, and although non-significant, average ratings of anxiety continued to be lower in the paratroopers throughout the laboratory test (see Figure 2). Therefore it would seem that the patterns of response to stress differ in more than one way in paratroopers and bomb disposal operators. Paratrooper veterans detected significant bodily reactions during the test (BSQ) but did not seem to associate these with anxious feelings (RAQ) and little cardiac responsiveness occurred, whereas bomb disposal operators who reported a similar number and severity of bodily reactions associated these with higher anxiety and were found to have more marked cardiac responsesiveness. The paratroopers appear to show desynchronous responses to stress whereas bomb disposal operators show relative synchrony. The labelling of the paratroopers' reactions as 'fearless' is appropriate because their perception of bodily reactions was not reported as anxiety and their cardiac responsiveness to stress remained low; hence low anxiety and lack of responsiveness equates with a "fearless" classification.

The differences in stress responses between bomb disposal operators and the veteran paratroopers may well result from differences in selection and training. Information on the selection of bomb disposal operators has been published (Hallam, 1983) and will be compared with data that has been collected in members of the Parachute Regiment. However it is clear at the outset that the roles and therefore the training of these two groups of army personnel are very different. Bomb disposal operators are trained for a relatively non-aggressive role and understand from the outset that they will have limited exposure to the dangers associated with service in Northern Ireland (maximum of two 4-month tours of duty). They are also aware that there is a low casuality nate in their corps. In contrast, paratroopers are trained to be aggressive and accept their role as an elite force which can be called upon to conduct operations where the likelihood of casualties during war is high. Towards these different ends the training of paratroopers routinely includes more frequent exposures to dangerous situations (e.g. parachute jumping, survival exercises). Consequently

the development of a more fearless attitude (pre-test BSQ ratings) and lower reactions to stress (RAQ and cardiac response) might be expected either as a result of training, or from the selection of recruits who already have these qualities. Whether the greater similarity between Falklands veterans and decorated, as compared with non-decorated bomb disposal personnel is attributable to pre-existing factors or arise as the result of operational experience cannot be ascertained from work completed so far. The prospective study of bomb disposal operators (study II) may help to elucidate this to some extent.

The investigation of whether differences in cardiac responsiveness between decorated and non-decorated paratrooper veterans might be explained by differences in physical fitness was compromised by the absence of significant differences in HR between these two groups. Evidence to support the general assertion that increases in HR are lower during stress in individuals who have greater physical fitness was not found.

SUMMARY and CONCLUSIONS:

Members of the Second Battalion of the Parachute Regiment who had been decorated for conduct during the Falklands War did not differ from similar but non-decorated paratroopers in a cardiac measure of responsiveness to laboratory stress, or in prospective or retrospective ratings of anxiety. A relationship between estimates of physical fitness and cardiac response to stress in paratrooper veterans was not found.

When the results from the two groups of paratrooper veterans were combined to form a single group, it was found that their cardiac responsiveness and subjective accounts of anxiety were lower than those of non-decorated bomb disposal operators. Their low cardiac responsiveness resembled the pattern shown by decorated bomb disposal operators.

Table 1

Heart Rate (beats/minute) in Decorated (n = 13) and Non-Decorated (n = 16) Falkland Veterans During the Stress Test

CONDITION	GROUP	MEAN	S.D.	df	t	Probability
Tone only	Decorated	81.2	6.6	28	0.6	ns
	Non-decorated	78.8	9.3			
Tone & Shock	Decorated	79.7	6.9	28	0.23	ns
	Non-decorated	78.0	10.7			
600/400Hz Discrimination	Decorated	82.2	6.7	28	0.10	ns
	Non-decorated	81.0	11.9			
600/550Hz Discrimination	Decorated	80.9	7.6	28	0.25	ns
	Non-decorated	79.1	10.6			
600/590Hz Discrimination	Decorated	80.9	7.4			
	Non-decorated	78.2	10.2	28	0.60	ns
660/600Hz Discrimination	Decorated	79.7	8.4	28	0.36	ns
	Non-decorated	77.7	9.8			

Table II

Pre and Post Test Questionnaire Responses in Falkland Veterans

		MEAN	S.D.	df	t	Probability
ANXIETY QUESTIONNAIRE						
Request to volunteer	Dec	10.6	13.8	32	0.13	ns
	Non-Dec	10.0	15.1			
Arranging appointment	Dec	9.5	17.4	32	0.59	ns
	Non-Dec	6.6	10.6			
Earlier that a.m.	Dec	6.8	8.1	32	-1.76	.09
	Non-Dec	12.9	11.6			
Just before test	Dec	17.1	12.8	32	-0.33	ns
	Non-Dec	19.1	20.9			
During the un-avoidable shock	Dec	33.1	16.5	30	0.54	ns
	Non-Dec	28.9	25.8			
After learned to avoid shock	Dec	15.6	16.0	31	-1.00	ns
	Non-Dec	22.9	24.9			
Difficult final part of test	Dec	27.2	18.9	31	0.71	ns
	Non-Dec	29.8	20.1			
Just after the test	Dec	8.6	11.7	31	0.97	ns
	Non-Dec	8.5	11.7			
BODILY SENSATIONS QUESTIONNAIRE						
Pretest severity	Dec	19.7	19.3	32	1.46	ns
	Non-Dec	11.7	11.0			
Retrospective severity	Dec	24.6	21.6			
	Non-Dec	26.0	25.2	32	-0.17	ns
Pretest Number	Dec	6.2	6.3	32	1.42	ns
	Non-Dec	3.8	2.8			
Retrospective number	Dec	8.5	6.4	32	0.80	ns
	Non-Dec	7.1	3.6			

Table III

Falklands Veterans Study:
Physical Fitness in Decorated and Non-Decorated Soldiers

	Group	(n)	Mean	Standard Deviation	df	t	Probability
Resting Pulse Rate	Decorated	16	67.6	7.5	32	0.9	ns
	Non-Dec	18	67.4	11.9			
Pulse Rate During Exercise	Decorated	15	129.7	12.9	30	2.1	ns
	Non-Dec	17	116.7	21.1			
Post Exercise Recovery of Pulse Rate	Decorated	15	94.7	17.9	31	0.6	ns
	Non-Dec	18	90.3	21.0			
Estimated Time Spent Exercising (mins/wk)	Decorated	15	234.7	171.0	31	1.8	ns
	Non-Dec	18	346.1	174.8			
Frequency of Exercise/ week	Decorated	15	6.1	4.2	31	0.7	ns
	Non-Dec	18	6.9	3.2			

Table IV

Correlations between Pulse Rate During Phases of the Laboratory Test and Estimates of Physical Fitness in Falklands Veterans (n = 29)

Estimate of Fitness	Tone	Tone and Shock	Discrimination Tasks 600/400	600/550	600/590	600/600
Recovery from Exercise	.72	.74	.66	.73	.72	.78
Pulse rate during exercise	.68	.66	.57	.62	.63	.70
Frequency of training (per week)	.19	.15	-.02	.01	-.03	.16
Time spent training (minutes per week)	.13	.11	-.01	.03	-.01	.13

($r = 0.40$; $p < 0.01$)

Table V

Changes in Heart Rate from the Baseline 'Tone Only' Condition in Subsequent Phases of the Laboratory Test. Comparisons Between Falklands Veterans (FV) and Decorated (DB) and Non-Decorated (ND) Bomb Operators (beats/min.)

Condition	Group	Mean	S.D.	df	t*	Probability
Tones & Shock	FV (n=29)	-1.06	3.86			
	DB (n= 8)	2.75	4.33	35	-2.42	0.3
	NB (n= 8)	3.58	7.39	35	-1.71	ns
600/400Hz	FV	1.66	4.69			
Discrimination	DB	12.10	8.18	35	-3.46	.01
	NB	10.14	9.27	35	-2.50	.05
600/550Hz	FV	0.02	4.21			
Discrimination	DB	6.76	6.27	35	-3.60	.001
	NB	4.83	3.58	35	-2.95	.01
600/590Hz	FV	-0.45	4.57			
Discrimination	DB	4.94	4.27	35	-2.99	.005
	NB	5.66	5.47	35	-3.21	.005
600/600Hz	FV	-1.27	4.26			
Discrimination	DB	3.41	6.51	35	-2.44	.02
	NB	6.99	8.22	35	-2.74	.03

* (For differences between FV and other groups. Differences between DB and NB were all non-significant, $p > 0.05$.)

Table VI

Comparison of Questionnaire Ratings in Falkland Veterans (FV, n=30), Decorated (DB, n=8) and Non-Decorated (ND, n=8) Bomb Disposal Operators

Questionnaire	Group	Mean	S.D.	df	f	Probability
BSQ Total (pretest)	FV	14.4	15.8			
	DB	35.7	18.5			
	NB	37.6	16.2	2,43	9.67	.001
BSQ Number (pretest)	FV	4.6	5.0			
	DB	12.2	6.2			
	NB	12.4	6.8	2,43	10.15	.001
BSQ Total (post-test)	FV	22.8	18.5			
	DB	20.4	15.4			
	NB	28.3	13.4	2,43	0.46	ns
BSQ Number (post-test)	FV	7.6	5.2			
	DB	6.0	3.6			
	NB	10.2	7.1	2,43	1.33	ns
RAQ						
Receive Request to Volunteer	FV	9.4	11.7			
	DB	19.5	17.3			
	NB	11.3	11.3	2,43	2.0	ns
Arranging Appointment	FV	5.9	10.7			
	DB	15.9	19.5			
	NB	10.0	10.7	2,43	2.08	ns
Earlier that A.M.	FV	10.2	10.6			
	DB	22.1	15.0			
	NB	11.5	8.1	2,43	3.70	.03
Just before the test	FV	17.6	16.1			
	DB	34.9	17.7			
	NB	36.3	16.0	2,43	6.25	.005
During Unavoidable Shock	FV	32.5	21.6			
	DB	55.2	18.9			
	NB	56.3	27.7	2,42	5.58	.01
After Learning to Avoid Shock	FV	18.3	18.8			
	DB	28.4	14.5			
	NB	23.8	16.9	2,42	1.10	ns
During the most difficult Discrimination	FV	28.5	20.3			
	DB	42.1	21.8			
	NB	43.8	27.7	2,42	2.26	ns
Just after the test	FV	9.1	12.0			
	DB	13.8	10.7			
	NB	8.1	10.0	2,42	0.61	ns

Table VII

Average number of shocks received by Falklands Veterans (FV), Decorated (DB) and Non-Decorated (NB) Bomb Disposal Soldiers

Group	Tone Discriminations				Total Shocks
	600/400Hz	600/550Hz	600/590Hz	600/600Hz	
FV (n=29)	0.52	1.00	2.10	2.58	6.20
DB (n= 8)	0.50	0.38	1.88	3.12	5.88
NB (n= 8)	0.38	0.75	2.50	2.00	5.63

Legends to Figures

Figure 1: Heart rate in decorated (n = 13) and non-decorated (n = 16) Falklands veterans. Differences between groups were non-significant.

Figure 2: Comparisons of retrospective ratings of anxiety during the stress test between decorated and non-decorated Falkland veterans and bomb disposal (BD) operators. Anxiety was reported to be lower by Falklands veterans 'earlier that am', 'just before the test' and 'during unavoidabel shock' (see Table VI).

Figure 3: Comparison of HR in Falklands veterans (n = 29) and BD operators who were decorated (n = 8) or non-decorated (n = 8). Differences between groups varied significantly over trial conditions ($p < 0.01$). Falkland veterans show more similar HR to decorated BD personnel during the shock avoidance trials.

Figure 4: Changes in HR (cardiac response) from the baseline 'tones only' condition reveal little response in Falkland veterans relative to both BD groups ($p < 0.001$) under all stress conditions, with the exception of the comparison with non-decorated BD operators during the tones and shock condition.

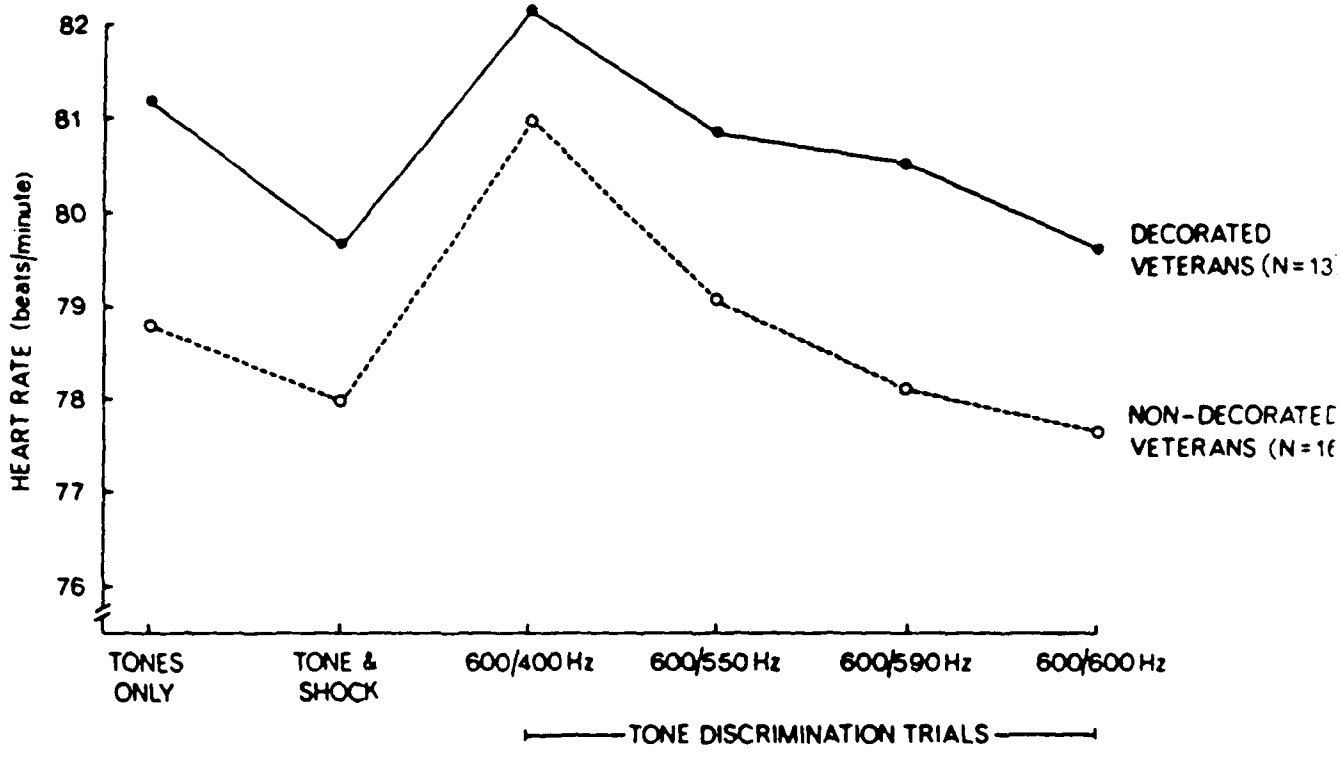
82
81
80
79
78
77
76
HEART RATE (beats/minute)
DECORATED VETERANS (N=13
NON-DECORATED VETERANS (N=16
TONES ONLY
TONE & SHOCK
600/400 Hz
600/550 Hz
600/590 Hz
600/600 Hz
TONE DISCRIMINATION TRIALS

Figure 1

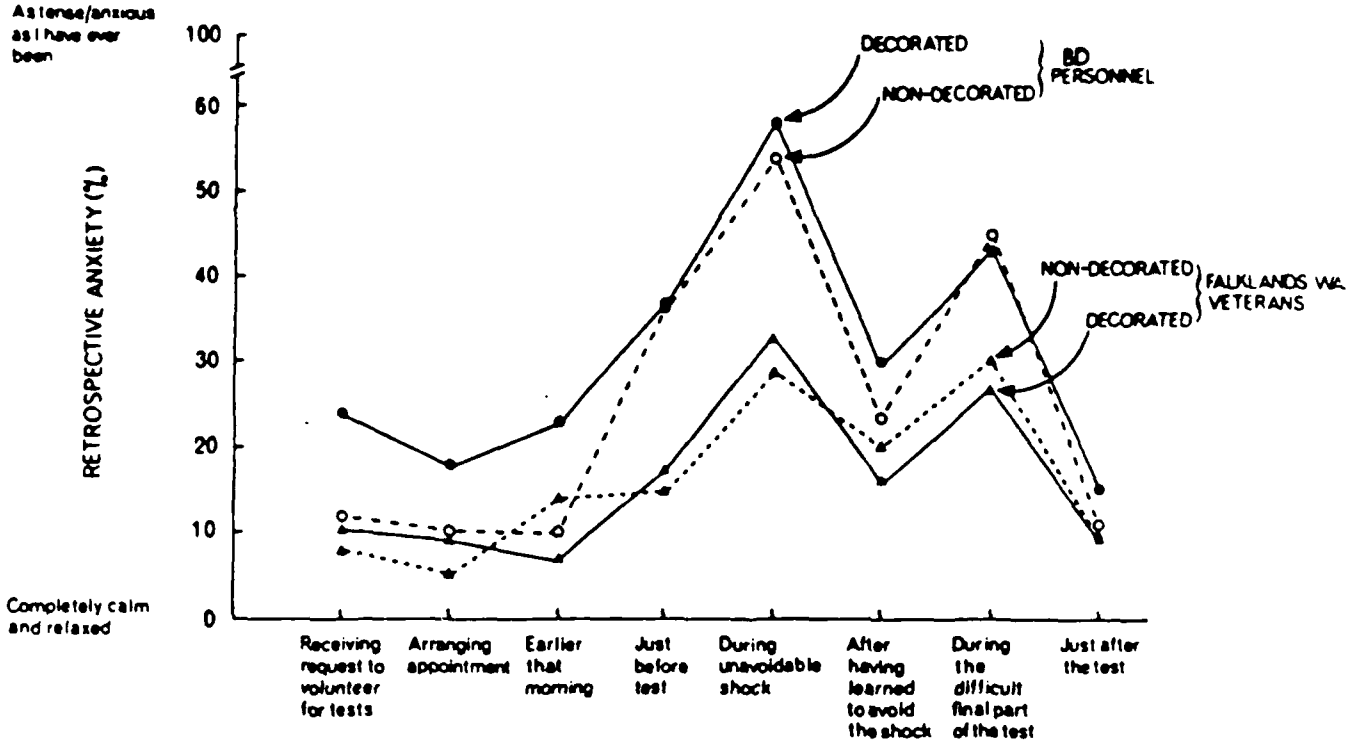
As tense/anxious as I have ever been
Completely calm and relaxed
RETROSPECTIVE ANXIETY (%)
100
60
50
40
30
20
10
0
DECORATED
NON-DECORATED
BD PERSONNEL
NON-DECORATED
DECORATED
FALKLANDS WAR VETERANS
Receiving request to volunteer for tests
Arranging appointment
Earlier that morning
Just before test
During unavoidable shock
After having learned to avoid the shock
During the difficult final part of the test
Just after the test

Figure 2

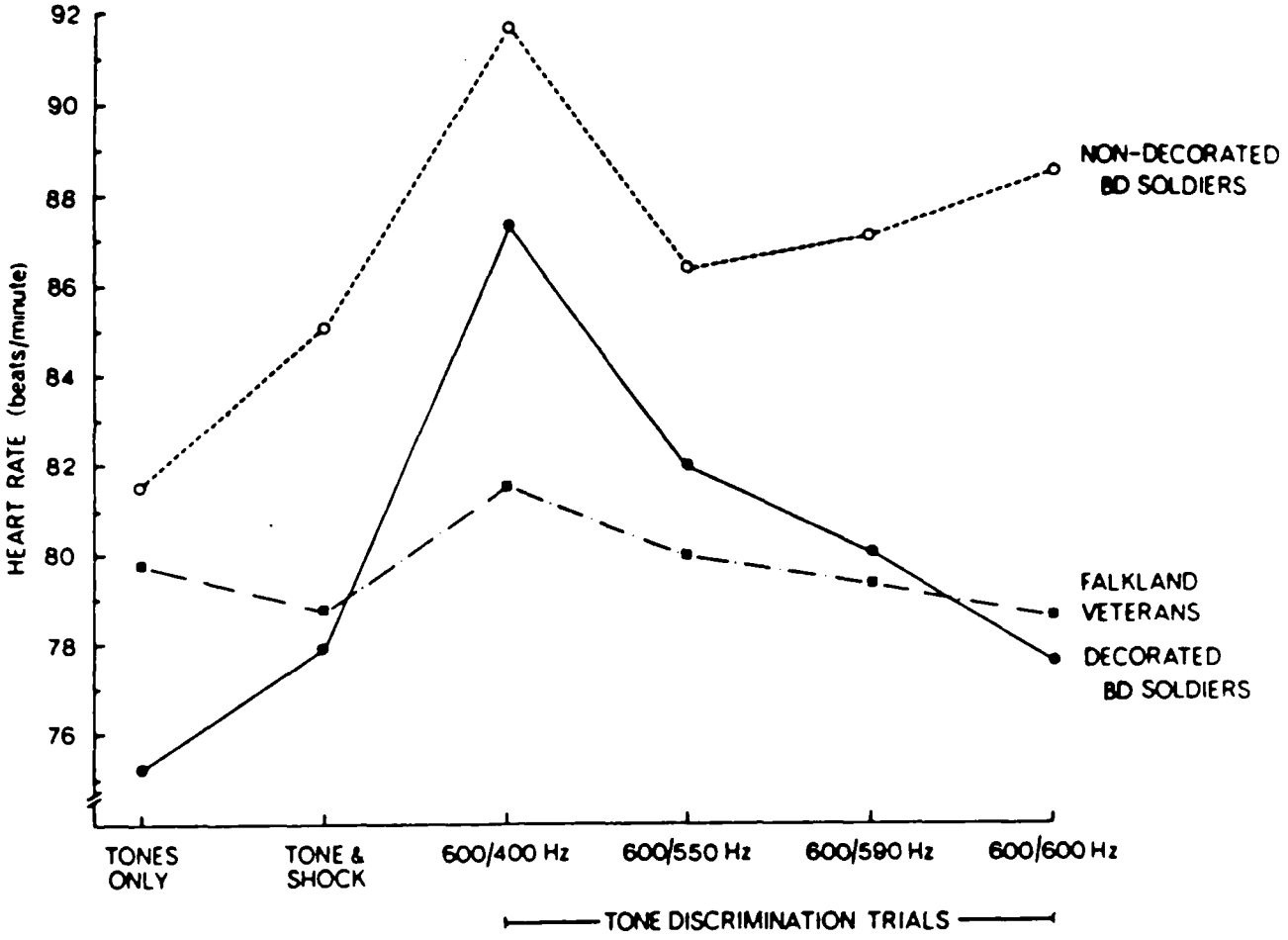
92
90
88
86
84
82
80
78
76
HEART RATE (beats/minute)
NON-DECORATED BD SOLDIERS
FALKLAND VETERANS
DECORATED BD SOLDIERS
TONES ONLY
TONE & SHOCK
600/400 Hz
600/550 Hz
600/590 Hz
600/600 Hz
TONE DISCRIMINATION TRIALS

Figure 3

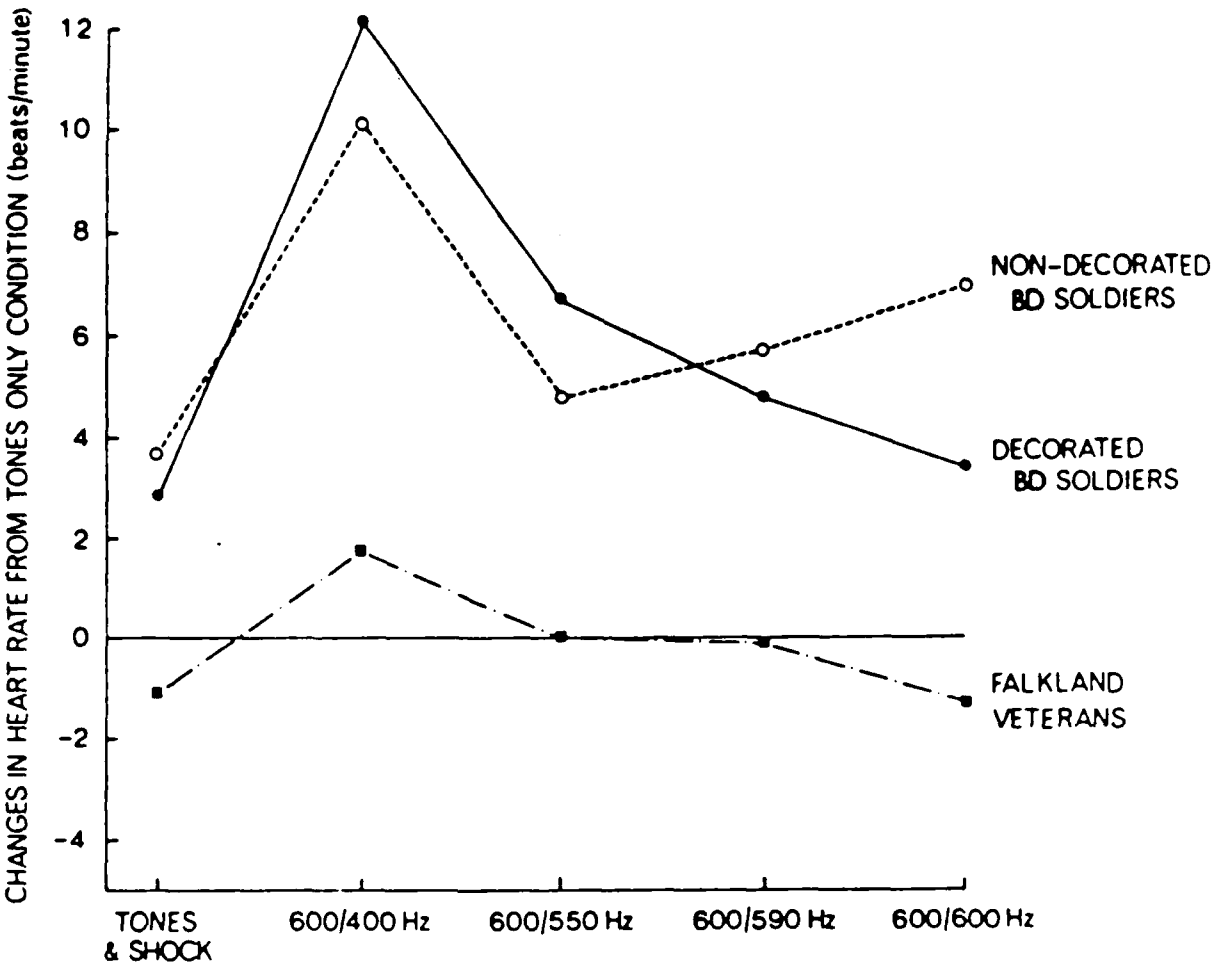
CHANGES IN HEART RATE FROM TONES ONLY CONDITION (beats/minute)
12
10
8
6
4
2
0
-2
-4
NON-DECORATED BD SOLDIERS
DECORATED BD SOLDIERS
FALKLAND VETERANS
TONES & SHOCK
600/400 Hz
600/550 Hz
600/590 Hz
600/600 Hz

Figure 4

References

Biersner, R.J., Ryman, D.H., Rahe, R.H. (1977) Physical psychological blood serum and mood prediction of success in preliminary underwater demolition team training. Military Medicine, 142, 215-219.

Cox, J.P., Evans, J.F., Jamison, J.L. (1979) Aerobic power and tonic heart rate responses to psychosocial stresses. Personal and Social Psychology Bulletin, 5, 160-163.

Sinyor, D., Schwartz, S.G., Peronnet, F., Brusson, G., Seragarison, P. (1983) Aerobic fitness level and reactivity to psychosocial stress: Physiological, biochemical and subjective measures. Psychosomatic Medicine, 45, 205-217.

Hull, E.M., Young, S.H., Ziegler, M.G. (1984) Aerobic fitness affects cardiovascular and catecholamines response to stressors. Psychophysiology, 21, 353-360.

O'Connor, K., Hallam, R.S., Rachman, S. (1985) Fearlessness and Courage: a replication experiment. British Journal of Psychology, 76, 187-198.

Hallam, R.S. (1983) Fear and Courage amongst military bomb disposal operators: psychometric analysis. Advances in Behaviour Research and Therapy, 4, 105-120.

Cox, D., Hallam, R.S., Rachman, S. (1983) An experimental analysis of fearlessness and courage. British Journal of Psychology, 74, 107-117.

STUDY II A Prospective Study of Fear and Courage in Bomb Disposal Operators

A Prospective Study of Fear and Courage in Bomb Disposal Operators

Introduction

Cox, Hallam, O'Connor and Rachman (1983) found that bomb disposal operators who had received decorations for service in Northern Ireland showed lower cardiac responsiveness in a laboratory stress experiment than did non-decorated operators of comparable experience. This finding was replicated by O'Connor, Hallam and Rachman (1985).

It is not known whether these differences in response to stress were present prior to the award of a decoration for gallantry. Are there constitutional differences which predispose soldiers to fearlessness or do these differences arise from the personal consequences of receiving a decoration for an act of bravery? The present experiment was designed to investigate this question by obtaining data on laboratory stress reactions before bomb disposal operators went on tour in Northern Ireland. Additionally we hoped to predict which operators were likely to act courageously or perform at a higher level generally during their tour of duty. Successful predictions would have obvious practical benefits as well as helping to elucidate the nature of courage and of fearlessness.

Subjects

Twenty-nine EOD personnel from RAOC, Didcot were tested. Group I consisted of 14 soldiers who had not been to N.I. as No.1 operators and Group 2 consisted of 15 soldiers who had been to N.I. once previously as No.1 operators but were not decorated.

Procedure

Each soldier had completed the laboratory stress test as described previously in detail (see O'Connor, Hallam and Rachman, 1985). Prior to the laboratory test and immediately afterwards, two questionnaires were completed. These comprised the Bodily Sensations Questionnaire (BSQ) and the Retrospective Anxiety Questionnaire (RAQ). An estimate of physical fitness was made after the laboratory stress test. The subjects were also required to report subjective fear levels at various states prior to, during and after the laboratory stress test - as in the

two published studies. Each soldier undertook moderate exercise (a one-step test where 90 steps were completed in three minutes), and the recovery of pulse rate was recorded subsequently, at rest, for three minutes.

An arrangement had been made with RAOC, Didcot for the provision of information about each operator's performance on the next tour of duty in N.I. Reports were completed by the immediate superior officer of each soldier when in N.I. In this way, laboratory data could be related to the decorated/non-decorated criterion, and to the officer's rating of overall on-tour performance. This information about operational performance is being collected and will be completed over the next 3 years as the 29 operators complete their tours in N.I.

Results

Physiological data on heart rate are being stored and will be included as a supplement to this report, when the study ends in 3 years time.

Questionnaire data are summarised in Table 1. Differences between Groups 1 and 2 were not found to be significant on the pre- or post-test ratings for the (BSQ) or the (RAQ).

The results for age, rank and physical fitness are given in Table 2. Soldiers in Group 2 are significantly older than those in Group 1 as expected, because they had already served in N.I. as No.1 operators. The differences in seniority were not significant. No differences in physical fitness were found.

To date 8 operators have completed tours in N.I., and reports have been obtained from their officers regarding operational performance. One soldier in the study has left the army, one will not go to NI and two have repeatedly failed the training course. Follow-up information remains to be collected on 17 soldiers.

Plans: Reports on operational performance will continue to be collected over the next 3 years and will be added to the existing data files on each soldier. When completed, data from these files will be analysed with the dual aims of:

1) Elucidating the nature of courage;

2) Attempting to predict courageous performance.

In order to complete the study a formal request for modification was submitted on March 5th, 1986. The cost for the 3-year period will be $44,000, of which the total cost to ERO will be $18,606.

TABLE 1

PROSPECTIVE STUDY ON BOMB DISPOSAL OPERATORS:
ANALYSIS OF QUESTIONNAIRE DATA USING t-TEST

	Group	(n)	Mean	Standard Deviation	df	t	Probability
BSQ pre	1	14	19.1	18.0	27	1.5	ns
	2	15	11.0	7.9			
BSQ post	1	14	24.9	24.6	27	0.6	ns
	2	15	20.2	19.3			
RAQ							
Request to Volunteer	1	14	17.0	17.7	27	1.0	ns
	2	15	10.6	18.0			
Arranging Appointment	1	14	14.3	21.3	27	0.9	ns
	2	15	8.3	13.0			
Earlier that am	1	14	20.0	13.5	27	0.2	ns
	2	15	18.1	25.0			
Just before test	1	14	27.0	19.7	27	0.7	ns
	2	15	21.5	31.3			
During Unavoidable Shock	1	14	36.1	21.9	27	0.5	ns
	2	15	31.3	24.7			
After learning to avoid shock	1	14	12.9	14.5	27	0.6	ns
	2	15	18.0	21.2			
During difficult final part of test	1	14	28.4	22.5	27	0.3	ns
	2	15	25.3	28.5			
After the test	1	14	6.0	10.9	27	0.1	ns
	2	15	5.6	7.9			

TABLE 2

PROSPECTIVE STUDY ON BOMB DISPOSAL OPERATORS:
RESULTS FOR PHYSICAL FITNESS AND DESCRIPTIVE INFORMATION

	Group	(n)	Mean	Standard Deviation	df	t	Probability
Age	1	14	26.6	2.3	27	3.6	0.001
	2	15	30.5	3.5			
Rank	1	14	1.4	0.5	27	0.2	ns
	2	15	1.1	0.4			
Resting Pulse Rate	1	14	72.5	10.2	27	0.2	ns
	2	15	71.7	8.0			
Pusle Rate During Exercise	1	14	136.6	9.6	27	1.7	ns
	2	15	143.7	12.5			
Post Exercise Recovery of Pulse Rate	1	14	95.5	18,5	27	1.5	ns
	2	15	105.7	18.5			
Estimated Time Spent Exercising (mins/wk)	1	14	161.4	148.6	27	1.1	ns
	2	15	113.7	76.6			
Frequency of Exercise/wk	1	14	2.9	3.0	27	0.9	ns
	2	15	3.9	3.5			

Study III Fear and Courage in Novice Paratroopers Undergoing Parachute Training

Fear and Courage in Novice Paratroopers Undergoing Parachute Training

Introduction

Novice paratroopers who were recruits to the Parachute Regiment, were asked to complete a series of questionnaires at various points during training which related to aspects of fear and confidence associated with their first aeroplane jump. The main aim of the study was to investigate whether or not patterns of questionnaire responses would allow trainees to be grouped into categories of courageous or fearless jumpers.

Rachman (1978) attempted to distinguish between courageous and fearless behaviour. In both cases an act is carried out, but in courageous individuals, fear is experienced, whereas in the latter the action is performed in the relative absence of fear (Cox, Hallam, O'Connor and Rachman, 1983; O'Connor, Hallam and Rachman, 1985; McMillan and Rachman, submitted). In an earlier pilot study, which the present study replicates, Rachman (1983a)outlined specific predictions from Bandura's (1977) self-efficacy theory. It was predicted that paratroopers who are relatively fearless should have relatively high self-efficacy scores *initially, and* that following their first aeroplane jump they should report good performance and low levels of fear. In addition, fearless performers should have low scores on a scale of hypochondriasis and fewer fears generally. It was predicted that self-efficacy would improve during training, and indeed, Rachman (1983a) found evidence for this in a pilot study on 21 novice paratroopers. The predicted negative relationship between initial self-efficacy and experienced fear during jumping was also found, but correlations between self-efficacy and jumping performance did not reach significance. Hence limited evidence for the concept of fearlessness was found in the pilot study.

The present study was designed to examine these hypotheses more closely by investigating a larger sample of 105 trainee paratroopers. It was hypothesized that two patterns of results corresponding to courageous and fearless performers would be revealed. Fearless performers would be expected to have higher self-efficacy and confidence levels pre-jump, to perform well, to experience lower fear and jitteriness and not to attribute lower amounts of danger to the task; they would be expected to be less likely to perceive bodily reactions associated with anxiety. In

contrast, courageous performers would be expected to have somewhat lower self-efficacy and confidence to begin with, would believe that they have performed less well and would experience higher levels of fear and jitteriness in association with a greater perception of bodily reactions; the task would be perceived by them as being more dangerous.

Finally, the bodily reactions reported by the paratrooper trainees during their first aeroplane jump will be compared to those reported in other studies on other groups during stress or danger and additonally, to symptoms of anxiety reported by patient populations.

Procedure: A battery of questionnaires was administered to 105 trainee paratroopers three times during their parachute training course. This battery consisted of subjective assessments of (1) self-efficacy and (2) expected confidence, performance, fear, jitteriness and dangerousness regarding their first parachute jump; (3) hypochondriasis scale; (4) the fear survey questionnaire (FSQ) which relates to specific fears not associated with parachute jumping and (5) the bodily sensations questionnaire (BSQ) which provides an indication of the number and severity of bodily reactions associated with anxiety or stress which were perceived.

Questionnaires were completed during the first day of parachute training and again on the morning prior to their first aeroplane jump. A final series of questionnaires was completed retrospectively at the end of the parachute training course. The battery of questionnaires is shown in the Appendix. Questionnaires 1 to 4 were given initially; questionnaires 2 and 5 after parachute jump from a balloon but prior to the aeroplane jump; questionniares 1, 2 and 5 at the end of the course. Instructions were altered appropriately for each stage.

Results

(1) General Information and Changes Occurring During Training

Data were collected on 105 soldiers, all of whom were recruits to the Parachute Regiment undergoing parachute training at Brize Norton for the first time. Less than 5% of trainees were excluded because they did not complete the course due to minor injury. No one refused to jump.

The average age of the trainees was 19.1 ± 2.02 (m ± SD) years. Scoring on the fear survey questionnaire (FSQ) was generally low, revealing a mean of 3. 6 ± 3.4 (SD). Of the 105 soliders only nine scored 5 or more on the hypochondriasis scale. The sample generally reported very few bodily complaints and only a moderate level of hypochondriasis in these nine soldiers.

The changes in self-report measures between the onset and the end of training are presented in Table I. Improvements occurred in self-efficacy and confidence ($p < 0.001$), and jitteriness and fearfulness decreased ($p < 0.01$). Reports of both the number and severity of bodily reactions (BSQ) experienced during the jump were found to be greater than those anticipated ($p < 0.001$). The expected ability to perform the jump itself did not differ markedly from post-jump reports, nor were differences between expected and experienced dangerousness significant ($p > 0.05$).

(2) Principal Components Analysis

Eighteen variables were included in the analysis: the results from the 'H' Scale, Fear Survey Schedule, Bodily Sensations Questionnaire (total score and number of sensations, pre- and post-jump) and ratings of self-efficacy, confidence, performance, jitteriness, fearfulness and dangerousness prospectively and retrospectively.

Three components emerged which had eigenvalues equal to or greater than 1.0. (see Table II). An unrotated solution was used as it gave a clearer factor structure. Loadings on components with values greater or equal to 0.25 are discussed; this cut-off was used because it results in the clearest picture from the analysis.

The first principal component comprised more than 40% of the total variance and was labelled "courageous type". The pattern formed by variables which load on this component (Table III) indicated initially low confidence, poor expected performance, and anticipation of jitteriness, fear and many relatively severe bodily reactions during the first aeroplane jump. The "courageous" profile also included a relatively high score on the 'H' scale score and the positive loading of the FSQ suggested anxiety was somewhat generalized to other situations. Retrospective accounts show that confidence and self-assessment of

performance remain relatively low and that self-efficacy is poor. Jitteriness, fear, danger and bodily reactions were experienced during the jump. As this pattern of results indicates both anticipated and experienced anxiety, but nevertheless, was reported in conjunction with successful performance (all soldiers jumped successfully and passed the training course), members of such a group could be defined as "courageous" following Rachman's (1978) criteria.

The second principal component described a "fearless type". The associations between variables in this case revealed initial confidence and anticipation of good performance, although bodily reactions were expected to occur during the aeroplane jump. Following the jump, confidence was maintained and good performance reported. A larger number of bodily reactions were perceived, but at a relatively low level of severity. Low levels of jitteriness, fearfulness and danger were also experienced. Hence this pattern, which comprised a positive pre-jump report and low levels of experienced anxiety corresponds to Rachman's definition of fearlessness.

The final component had an eigenvalue of borderline significance. The pattern of response revealed initial confidence, high self-efficacy and anticipation of good performance together with reports of low hypochondriasis, but despite an admission of fear in other situations. However, confidence was low retrospectively and jitteriness was experienced during jumping. Contrast between pre- and post-jump confidence ratings were evident in this profile suggesting a mismatching of expectation with experience in a negative direction. Hence this component was labelled "overconfident".

(3) Intercorrelations Between Variables

These are largely summarised by the principal components analysis. However, as specific predictions were made from Bandura's self-efficacy theory, relevant data will be reported here. Self-efficacy was subdivided into initially high (> 70, $n = 49$) or low (< 30, $n = 18$) scores. The correlation matrix in Table IV revealed that high initial self-efficacy correlated positively with expected dangerousness ($p < 0.05$) and with retrospective accounts of performance ($p < 0.01$) and correlated negatively with hypochondriasis ($p < 0.05$) and the severity ($p < 0.01$) and number ($p < 0.05$) of bodily reactions experienced during jumping.

Trainees who had relatively low self-efficacy initially tended to expect to perform well ($p < 0.05$) and reported higher confidence retrospectively ($p < 0.05$); negative correlations were found with fearfulness retrospectively ($p < 0.05$). It is of note however that all correlations for high and low self-efficacy were less than 0.3 and hence contributed to less than 10% of the variance despite statistical significance.

Predictions were also made from Bandura's theory regarding associations between retrospective performance and other variables. Significant positive correlations were found for initial ($p < 0.01$) and retrospective ($p < 0.001$) self-efficacy, and for initial confidence ($p < 0.001$). Negative correlations with the hypochondriasis scale ($p < 0.05$), the severity ($p < 0.05$) and number ($p < 0.01$) of bodily reactions experienced and also jitteriness ($p < 0.01$) and dangerousness ($p < 0.01$) experienced were found.

(4) The Hypochondriasis Scale (Table V)

Scores were low on this scale (1.90 $\pm$, m $\pm$ SD). Comparisons were made between 9 soldiers who had a 'moderate' level of hypochondriasis (scores $\geq$ 5) and the remainder who had low levels (scores < 5) of hypochondriasis (n = 95). The results are presented in Table V.

A tendency for self-efficacy to be lower prospectively in the moderate group ($p < 0.06$) reached significance retrospectively ($p < 0.02$). In addition, expected performance was lower in the moderate group ($p < 0.02$). Differences between groups for other variables did not approach significance.

(5) Cluster Analysis (Table VI)

In order to determine whether or not ratings of individual recruits fitted the profiles of "courageousness", "fearlessness" or "overconfidence" as suggested by the principal components analysis (PCA), further analysis was required. Whereas the PCA reveals associations between variables, cluster analysis shows patterns of response for groups of individual subjects.

In the present study cluster analysis using Ward's Method (Everitt, 1980) was performed on 14 out of the original 18 variables. Pre- and post-jump ratings of the number of bodily sensations and jitteriness

were excluded because of similarity and overlap with other variables (i.e. BSQ total and fearfulness).

Results suggested that a 3 cluster solution was most meaningful, and details are given in Table VI. If a 2 cluster solution had been adopted the small 'overconfident' group became absorbed into the remaining clusters, which remained essentially similar. Solutions with more than 3 clusters were more difficult to interpret. Figure 1 summarises results for 5 pre-jump and 5 post-jump variables which were rated on similar analogue scales.

Perhaps most striking is the clear division between 'positive' variables (self-efficacy, confidence, performance) and 'negative' variables (fearfulness and dangerousness) in cluster 2. Members of this cluster comprise approximately a quarter of the sample overall (see figure 2). Clearly they were optimistic, confident and expected relatively low levels of fear pre-jump. Their beliefs were seemingly reinforced by the experience of jumping and this produced an even greater separation between positive and negative variables (see figure 1). As expected fear was relatively low and optimism regarding performance high, this group would fit the 'fearless' classification.

The first cluster comprised two-thirds of the sample. Here optimism was more modest and expected fear greater. However the experience of jumping once more led to improved ratings on positive variables and a reduction in fear. These recruits were therefore somewhat afraid of jumping, were modestly optimistic and benefited from the experience; hence they could be deemed 'courageous'.

The small third cluster (7.5% of recruits) also revealed modest initial expectations on 'positive' variables and moderate fearfulness. However the experience of jumping led to a marked increase in ratings of dangerousness and a decrease in confidence. Recruits belonging to this group benefited least from the experience of jumping. Overestimation of confidence and underestimation of dangerousness was also associated with relatively high scores on the fear survey schedule pre-jump and very high expected and experienced bodily sensations during jumping (see Table VI). No clear differences in confidence or dangerousness were found pre-jump when compared with other groups. The only pre-jump

distinction being higher FSQ and BSQ ratings. In summary, outcome in terms of training would seem to have been poorest for members of this group, and possibly this could have been predicted from pre-jump BSQ and FSQ ratings.

(6) Bodily Sensations Questionnaire

It can be seen from Table VII that a high degree of concordance between studies is found with regard to subjective reports of bodily reactions to stress or danger.

In the current study, out of 25 possible sensations, the seven most frequently reported were identical to those reported in the earlier study by Rachman (1983) also on paratrooper trainees, and 5 of the 6 most frequent reactions reported by Janis (1951), and 4 out of 6 of those cited by Schaffer (1947) were also found in the present study. In contrast, self-reports of anxiety symptoms by a clinical population (Wheeler et al. 1950) is at variance with the findings here, and only "palpitations" were common in the six most frequently cited symptoms (see Table VIII).

Discussion

The parachute training course for recruits to the Parachute Regiment was extremely successful. This was clear from the high pass rates in passing the course and from significant increases overall improvements in self-efficacy and confidence and decreases in jitteriness and fearlessness between the beginning and the end of the course. This finding is consistent with that of Rachman (1983).

As predicted, patterns of questionnaire response corresponding to 'fearlessness' and 'courageous' types were found. Cluster analysis made it clear that courageous individuals were most common, comprising two-thirds of the sample (figure 2). Courageous individuals had relatively modest expectancies about jumping and became, by and large, more positive following their first aeroplane jump. Therefore they benefited from this experience even although they were moderately fearful beforehand. The profile of 'fearless' individuals contrasted markedly. About one-quarter of the sample fell into this category which represented recruits who were highly confident before jumping and expected relatively low levels of fear and danger. Also of note were

the lowest scores for bodily reactions, on the Fear Survey Questionnaire and for hypochondriasis in this group. Post-jump they reported greater confidence and recalled less fear than was anticipated. This group seemed relatively unconcerned about the prospect of jumping and this expectancy was borne out. That this may be a more general characteristic of their personality would be supported by the low scores on the Fear Survey Questionnaire and for hypochondriasis.

The third group comprised less than 10% of the sample. They were the only individuals to show an overall loss of confidence after jumping, and the fact that this was associated with extremely high ratings for bodily reactions and higher fear questionnaire scores cannot be ignored. Whether their dramatic underestimation of expected danger resulted from their decrease in confidence, or was caused by it cannot be ascertained. However it seems likely that the high pre-jump ratings of bodily reactions and possibly also the tendency to experience fear more generally in other situations could have resulted in a pre-jump denial of the danger they expected to experience when jumping.

With regard to hypotheses of mismatching between expectancy and experience, it could be argued that the cluster analysis has revealed three of the four groups postulated by Rachman and Levitt (1985). Fearless recruits expected and experienced relatively little fear, or danger and few bodily reactions. They also showed modest improvements on already high levels of confidence. Hence they accurately assessed a positive outcome. Courageous individuals had more modest expectations. Although they experienced improvements in confidence and self-efficacy, their matching of expected and experienced fear and danger were good. They could be described as having accurate, but more pessimistic expectancies than the fearless group. The third group clearly revealed a mismatch of expectation and experience. They were overconfident and underestimated danger experienced. Recruits in this group might be more inclined to have poorer performances on subsequent jumps according to Rachman and Levitt's findings. Furthermore it could be argued that mismatching of perceived and predicted dangerousness was caused by a defensive denial mechanism as suggested by Fenz (1975) who also predicted poorer outcome for such a group in a study of civilian paratrooper trainees.

Predictions regarding self-efficacy, based on Bandura's (1977) theory were not supported by results from the principal components analysis. However results from the overall correlation matrix provide some support for Bandura's theory. An important finding is the positive correlation between high initial self-efficacy and experienced performance ($r = 0.25$). Hence recruits who initially believed that they would be able to carry out parachute jumps successfully under the variety of weather conditions listed in the self-efficacy questionnaire gave higher performance ratings retrospectively. This is reinforced by findings that initially high self-efficacy correlated negatively with the severity and number of bodily reactions actually experienced. A further correlation with expected dangerousness may seem inconsistent with Bandura's theory but would be compatible with the findings of good outcome following accurate predictions of dangerousness in the 'fearless' and 'courageous' groups in contrast to the somewhat lower self-efficacy found in the 'overconfident' group who underestimated the dangerousness experienced. Conversely initially low self-efficacy did not correlate with high retrospective ratings of performance, despite a prediction by these recruits that this would be the case. Self-efficacy was also found to relate to hypochondriasis. Soldiers who had moderate hypochondriasis also tended to have lower self-efficacy initially and this association was stronger retrospectively.

Bodily reactions experienced by trainee paratroopers during their first aeroplane jump are strikingly similar to those reported previously by Rachman (1983), to bomb disposal operators on duty in Northern Ireland (Cox and Rachman, 1983) and to World War II infantrymen and combat fliers (Schaffer, 1950; Janis, 1951). Cardinal amongst these are sweating, dry mouth, pounding heart and uneasy stomach sensations. These symptoms which are associated with the need to respond in situations that are dangerous, contrast with those reported by patients who suffer clinical anxiety. The clinical population reported by Wheeler et al. (1950) report sweating and dry mouth relatively infrequently, and the only high frequency symptom in common with soldiers is palpitations. Patients more often report dizziness, chest pain and feeling faint which are low frequency responses amongst soldiers. This dissociation between soldiers and patients under stress

might be due to preparation of the body for action in the former, whereas reactions in the latter may be more consistent with flight or avoidance of action.

Summary and Conclusions

The parachute training course was overall found to be extremely successful. Profiles of three types of recruit were identified and labelled as 'courageous', 'fearless' or 'overconfident'. It was predicted that recruits in the last category might be more likely to perform parachute jumps less well on subsequent occasions relative to members of the other groups.

Recruits who had high initial self-efficacy were less likely to report bodily complaints at the start of training and gave better ratings of performance during the aeroplane jump. Although these findings are consistent with Bandura's theory, more specific evidence in support of his view was not found.

Bodily reactions frequently associated with parachute jumping bear a close resemblance to findings by others on various groups of soldiers and airmen, but contrast with those reported by patients suffering from clinical anxiety and it is suggested that these may reflect 'fight' versus 'flight' preparation.

References

Bandura, A. (1977) Social Learning Theory. New York: Prentice Hall.

Cox, D. and Rachman, S.J. (1983) Performance under operational conditions. Advances in Behaviour Therapy, 4, 127-153.

Cox, D.,, Hallam, R., O'Connor, K. and Rachman, S. (1983) An experimental analysis of fear and courage. British Journal of Psychology, 74, 107-117.

Everitt, B.S.E. (1980) Cluster Analysis. London: Heinemann

Fenz, W.D. (1975) Strategies for coping with stress. In I.G. Sarason and C.D. Spielberger (eds.) Stress and Anxiety, 2. New York: Wiley.

Janis, I.L. (1951) Air War and Emotion and Stress. New York: McGraw Hill.

McMillan, T.M. and Rachman, S. Fearlessness and courage: A study of paratrooper veterans of the Falklands War. (submitted for publication)

O'Connor, K., Hallam, R. and Rachman, S. (1985) Fearlessness and courage: A replication experiment. British Journal of Psychology, 76, 187-197.

Rachman, S. (1977) Fear and Courage. San Francisco: Freeman & Co.

Rachman, S.(1983a) Fear and fearlessness among trainee parachutists. Advances in Behaviour Therapy, 4, 153-160.

Rachman, S. and Levitt, K. (1985) Panics and their consequences. Behaviour Research and Therapy, 23, 585-600.

Shaffer, L. (1947) Psychological Studies of Anxiety Reaction to Combat. USAAF Aviation Psychology Report No.14. Washington, DC: US Government Printing Office.

Wheeler, E.O., White, P.D., Reed, E.W., Cohen, M.E. (1950). JAMA, 142, 878-888.

Table I

Changes in Self-Report During Training

(means ± standard deviations, n = 105)

	Prospective	Retrospective	df	t	Probability
Self-efficacy	58.7 ± 28.7	85.5 ± 17.5	102	-8.74	.001
Confidence	67.5 ± 22.1	81.7 ± 22.3	104	-5.22	.001
Performance	61.6 ± 21.8	67.5 ± 41.1	100	-0.66	ns
Jitteriness	48.8 ± 19.6	38.9 ± 27.0	103	3.24	.01
Fearfulness	49.1 ± 23.2	38.7 ± 29.2	104	3.27	.01
Dangerousness	24.0 ± 27.5	28.4 ± 28.3	101	-1.31	ns
BSQ TOTAL	14.8 ± 19.3	28.5 ± 26.3	101	-5.90	.001
BSQ NUMBER	4.3 ± 4.8	7.7 ± 6.3	101	-6.81	.001

Table II

Principal Components

Principal Component	Components Name	Eigen Value	% Variance Explained	Compulsive Variance
I	Courageous Type	4.2	43.6	-
II	Fearless Type	1.7	17.3	60.8
III	Overconfident Type	1.0	10.4	71.2

Table III

Variables with Loading on Principal Components < 0.25

Principal Component								
I			II			III		
'H' Scale		0.39	BSQ Total	(pre)	0.56	'H' Scale		-0.32
Fear Survey Questionnaire		0.26	BSQ Number	(")	0.56	Fear Survey Questionnaire		0.30
BSQ Total	(pre)	0.72	Confidence	(")	0.25	Confidence	(pre)	0.47
BSQ Number	(")	0.68	Performance	(")	0.28	Performance	(")	0.30
Confidence	(")	-0.45	BSQ Number	(post)	0.30	Self-Efficacy	(")	0.28
Jitteriness	(")	0.38	Confidence	(")	0.37	Confidence	(post)	-0.45
Performance	(")	-0.43	Jitteriness	(")	-0.44	Jitteriness	(")	0.36
Fearfulness	(")	0.29	Dangerousness	(")	-0.25			
BSQ Total	(post)	0.76	Performance	(")	0.28			
BSQ Number	(")	0.80	Fearfulness	(")	-0.36			
Confidence	(")	-0.55						
Jitteriness	(")	0.41						
Dangerousenss	(")	0.25						
Performance	(")	-0.40						
Fearfulness	(")	0.51						
Self-Efficacy	(")	-0.37						

Table IV Intercorrelations Between Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. High Efficacy Pre	-																		
2. Low Efficacy Pre	-.42‡																		
3. Mean Efficacy Pre	.86‡	-.66‡																	
4. Mean Efficacy Post	.29‡	.00	.25*																
5. Confidence Pre	.14	-.05	.16	.27*															
6. Confidence Post	.07	.18**	-.05	.35‡	-.02														
7. Performance Pre	.08	.18**	.05	.37‡	.52‡	.20**													
8. Performance Post	.25*	-.07	.26*	.32‡	.12	.37‡	.17**												
9. Jitters Pre	-.11	-.10	-.13	-.27*	-.19	-.02	.31‡	-.15											
10. Jitters Post	.02	-.11	-.02	-.22*	-.11	-.36‡	-.10	-.23*	.22*										
11. Fear Pre	.03	-.09	-.01	-.05	-.07	-.12	-.20**	-.02	.11	-.02									
12. Fear Post	-.14	-.17**	-.06	-.28*	-.25*	-.25*	-.27*	-.11	.30‡	.41‡	-.10								
13. Danger Pre	.17**	00	.17**	-.02	-.15	-.09	-.03	.04	.01	.01	.09	.07							
14. Danger Post	-.02	-.10	-.01	-.11	-.02	-.14	-.17**	-.21**	.17**	.12	-.07	.21**	.18**						
15. FSQ	.07	.01	.03	-.06	.12	-.28*	.01	-.09	.11	.22*	-.10	.11	.08	.09					
16. 'H' Scale	-.22**	.15	-.20**	-.30‡	-.26*	-.02	-.24*	-.18*	.23*	00	.06	.10	.07	.16	.14				
17. BSQ Total Pre	-.04	-.07	.03	-.13	-.14	-.16	-.13	-.11	.12	.14	.15	.12	-.08	.02	.17**	.27*			
18. BSQ Total Post	-.17**	-.01	-.11	-.22**	-.12	-.34‡	-.18*	-.26*	.17**	.13	.26*	.24*	-.06	.16**	.18**	.23*	.41‡		
19. BSQ No. Pre	.08	-.06	-.01	.10	-.14	-.10	-.12	-.14	.10	.08	.14	.14	-.06	.06	.17**	.24*	.96‡	.41‡	
20. BSQ No. Post	-.24*	-.04	-.15	-.24*	-.15	-.25*	-.19**	-.25*	.20**	.19**	.28*	.32‡	-.04	.21**	.19**	.24*	.48‡	.88‡	.51‡

** = $p < 0.05$

* = $p < 0.01$

‡ = $p < 0.001$

Table V

Questionnaire Responses to Soldiers with 'H' Scale Scores < 5 (Low) or scores ≥ 5 (Moderate)

Questionnaire	Group	n	Mean	S.D.	df	t	Probability
Prospective							
Self-Efficacy	Low 'H'	95	60.3	28.8	102	1.91	0.06
	Mod 'H'	9	41.4	22.1			
Confidence	Low 'H'	96	68.2	22.8	103	1.04	ns
	Mod 'H'	9	60.0	20.0			
Performance	Low 'H'	92	62.4	22.4	99	2.23	0.02
	Mod 'H'	9	53.3	10.0			
Jitteriness	Low 'H'	95	48.1	19.8	102	-1.09	ns
	Mod 'H'	9	55.6	16.7			
Fearfulness	Low 'H'	96	48.0	23.1	103	-1.57	ns
	Mod 'H'	9	60.6	22.4			
Dangerousness	Low 'H'	94	22.5	26.6	101	-1.72	ns
	Mod 'H'	9	38.9	33.3			
BSQ Total	Low 'H'	95	14.6	19.1	101	-0.33	ns
	Mod 'H'	8	17.0	23.8			
BSQ Number	Low 'H'	95	4.3	4.8	101	-0.25	ns
	Mod 'H'	8	4.8	5.1			
FSQ	Low 'H'	95	3.6	3.4	102	-0.03	ns
	Mod 'H'	9	3.7	3.8			
Retrospective							
Self-Efficacy	Low 'H'	95	87.3	14.9	102	2.21	0.02
	Mod 'H'	9	65.8	29.0			
Confidence	Low 'H'	96	81.8	22.3	103	0.16	ns
	Mod 'H'	9	80.6	23.5			
Performance	Low 'H'	96	65.1	25.3	103	1.36	ns
	Mod 'H'	9	53.3	18.0			
Jitteriness	Low 'H'	96	39.1	27.6	103	0.26	ns
	Mod 'H'	9	36.7	20.6			
Fearfulness	Low 'H'	96	38.9	30.0	103	0.21	ns
	Mod 'H'	9	36.7	21.2			
Dangerousness	Low 'H'	95	27.9	28.8	102	-0.55	ns
	Mod 'H'	9	33.3	22.9			
BSQ Total	Low 'H'	95	28.3	30.0	102	-0.23	ns
	Mod 'H'	9	30.4	31.1			
BSQ Number	Low 'H'	95	7.6	6.3	102	-0.51	ns
	Mod 'H'	9	8.8	7.2			

Table VI

Cluster Analysis

Label		Courageous	Fearless	Over-confident
Cluster		1	2	3
N (% total)		62 (67%)	24 (26%)	7 (8%)
Self-Efficacy	pre	54.3 ± 27.4	75.9 ± 23.3	53.4 ± 17.9
	post	82.9 ± 18.2	95.0 ± 7.3	72.0 ± 19.4
Confidence	pre	58.5 ± 18.4	90.7 ± 15.1	63.6 ± 25.0
	post	80.4 ± 23.5	95.8 ± 7.0	52.1 ± 5.7
Performance	pre	54.6 ± 18.1	81.2 ± 21.1	50.0 ± 0.1
	post	57.1 ± 23.7	85.7 ± 19.6	50.7 ± 1.9
Dangerousness	pre	22.9 ± 26.4	21.9 ± 28.6	22.1 ± 26.1
	post	30.1 ± 29.6	19.8 ± 21.4	50.7 ± 27.5
Fearfulness	pre	52.6 ± 22.6	35.0 ± 21.1	64.3 ± 24.4
	post	41.5 ± 27.4	14.4 ± 17.9	50.7 ± 1.9
BSQ (Total)	pre	11.8 ± 13.6	6.3 ± 7.3	59.3 ± 22.5
	post	29.1 ± 23.7	13.7 ± 16.1	65.0 ± 27.2
'H' Scale	pre	2.3 ± 1.8	0.7 ± 1.3	2.1 ± 3.1
FSQ	pre	3.4 ± 3.1	2.5 ± 3.0	6.4 ± 4.4

Table VII

Bodily Reaction Reported Under Stress/Danger
(in ascending order of frequency)

Paratrooper Trainees Present Study (n = 105)	Paratrooper Trainees Rachman (1983) (n = 21)	Bomb Disposal Operators (N. Ireland, 1981) (Cox & Rachman, 1983)	Veteran Infantry (Janis, 1944)	Combat Fliers (Schaffer, 1944)
Sweating	Sweating	Pounding heart	Pounding heart	Pounding heart
Mouth dry	Pounding heart	Heavy breathing	Sinking stomach	Tense muscles
Stomach sensations	Urge to urinate	Dry mouth	Trembling	Irritability
Face hot	Face hot	Trembling	Sick stomach	Mouth dry
Pounding heart	Stomach sensations	Sweating	Cold sweat	Cold sweat
Urge to urinate	Trembling	Urge to urinate	Feel weak/ faint	Stomach unease
Trembling	Mouth dry			

Table VIII

Percentage of Trainee Paratroopers Reporting Symptoms of Anxiety Following a Parachute Jump (n = 105)

Symptom	Percentage of Soldiers	% Anxiety Patients (Wheeler et al 1950 n = 173)
Sweating	75	26
Dry mouth	65	14
Stomach sensations	56	
Face hot	55	21 (flushes)
Pounding heart	55	56
Urge to urinate	46	
Trembling	39	31
Heavy breathing	39	
Lump in throat	31	
Urge to vomit	29	
Muscle tension	28	
Shallow breathing	28	8 (panting)
Ringing/buzzing in ears	26	
Muscles twitching	25	
Nausea	25	
Headache	25	33
Urge to defecate	25	
Blood rushing to head	17	
Loss of balance	16	
Dizziness	15	45
Numbness of skin	14	34 (paraesthesia)
Tingling skin	14	
Pain in chest	13	49
Cold hands	12	
Feel faint	10	40

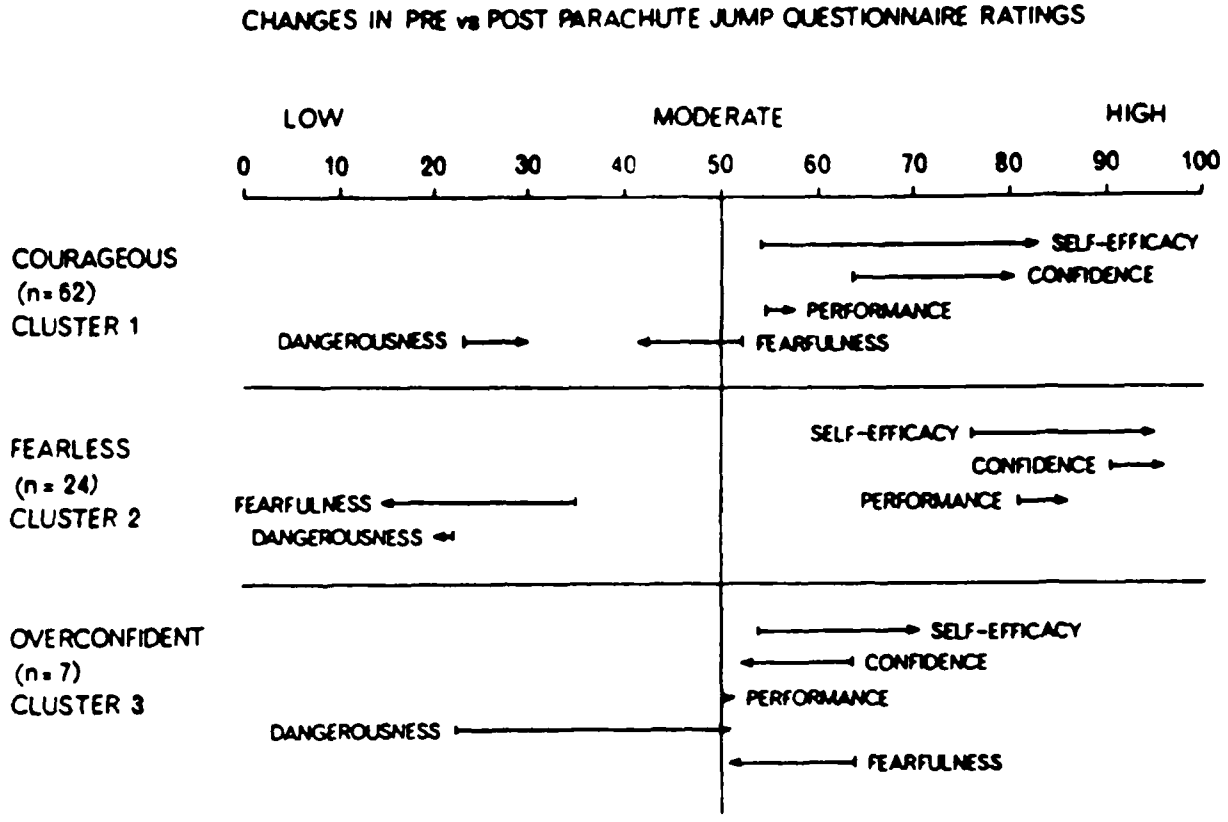
CHANGES IN PRE vs POST PARACHUTE JUMP QUESTIONNAIRE RATINGS
LOW
MODERATE
HIGH
0
10
20
30
40
50
60
70
80
90
100
COURAGEOUS
(n = 62)
CLUSTER 1
SELF-EFFICACY
CONFIDENCE
PERFORMANCE
DANGEROUSNESS
FEARFULNESS
FEARLESS
(n = 24)
CLUSTER 2
SELF-EFFICACY
CONFIDENCE
PERFORMANCE
FEARFULNESS
DANGEROUSNESS
OVERCONFIDENT
(n = 7)
CLUSTER 3
SELF-EFFICACY
CONFIDENCE
PERFORMANCE
DANGEROUSNESS
FEARFULNESS

FIGURE 1

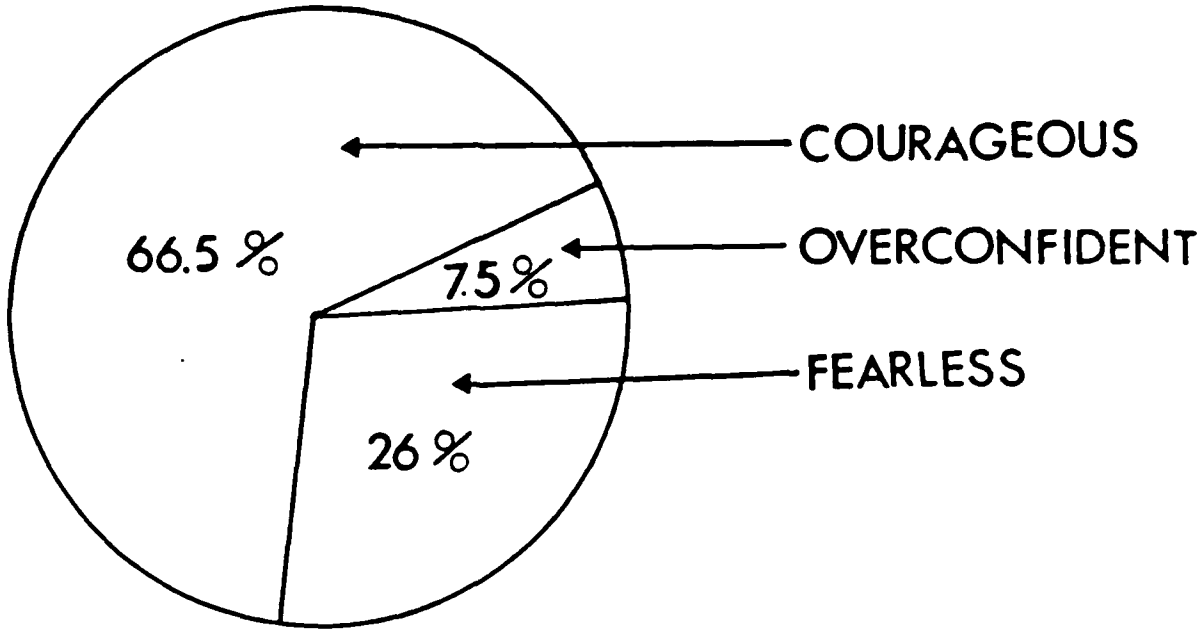

Figure 2

Study IV An Examination of Success and Failure in Novice Recruits Undergoing Training for the Parachute Regiment

An Examination of Success and Failure in Novice Recruits Undergoing Training for the Parachute Regiment

Purpose

The aim of this study was to evaluate whether or not any particular pattern of responses relating to personality, anxiety and physical fitness could be used to predict success or failure in novice recruits who are undergoing training for membership of the Parachute Regiment.

Rationale

Many recruits who are selected for training in order to become members of the Parachute Regiment are failed or drop-out of the course. The training course itself involves a number of activities which are likely to engender both physical and mental stress and also it requires successful performance on a number of tasks likely to provoke a degree of fear.

It is well known that stress and anxiety reduce efficiency on cognitive and motor tasks and a number of predictions are made on the basis of previous research. Bandura's (1977) theory suggests that self-efficacy is related to performance, and would predict a better outcome to recruits with higher levels of self-efficacy. In addition, predictions are made here regarding expected and perceived anxiety from the basis of our own work. Recruits who report few, if any, bodily or mental complaints and who have more positive scores on a scale of health and alertness, would be more likely to experience less fear in an anxiety-provoking situation and hence would be more likely to complete the course successfully. Implicit in this prediction is the distinction between fearlessness and courage. The former refers to performance of a dangerous act whilst experiencing low anxiety and the latter to performance of a dangerous act whilst experiencing high levels of fear. Hence, recruits that are, or who become relatively 'fearless' may be less likely to fail the course.

In addition personality profiles of the recruits were investigated with regard to their value as possible predictors of outcome.

Procedure

Fifty-one recruits to the Parachute Regiment were assessed, on day 1 and subsequently at intervals throughout the 22-week course.

1. Paratrooper Recruits

(a) Questionnaire Battery: Recruits were briefed about the study and completed a battery of questionnaires. These comprised (i) Cattell's 16 PF; (ii) Eysenck Personality Inventory; (iii) Self-Efficacy Questionnaires; (iv) Hypochondriasis Questionnaire; (v) Bodily Sensations Questionnaire; (vi) Fear Survey Questionnaire.

This battery (i-vi) was given during the first week of training and a shorter form (iii, v) was repeated prior to stressful parts of the training course e.g. assault course, survival training in Wales, prior to the first parachute jump.

(b) Fitness Test: Each recruit underwent a basic fitness test at the beginning of the training course.

(c) Final Assessment: The short battery of questionnaires was completed once more at the end of the training course.

2. Successful Recruits

To provide a baseline from which to compare recruits in training, personality data was collected on recruits within 6 months of successfully completing the training course. Data from successful and unsuccessful recruits will subsequently be compared.

Progress

Collection of information on successful recruits has been completed (n = 95), as has coding of this information in preparation for analysis. Two platoons of novice recruits (n = 51) were monitored during their training courses. The predictive value of these results regarding success or failure in training are currently being evaluated. Analysis of data is scheduled for completion in July 1986.

SUMMARY & CONCLUSIONS

Three new studies on paratroopers have been completed. In the first study, differences between decorated and non-decorated members of the Parachute Regiment who were also veterans of the Falklands War were not found in a laboratory stress test. This is in contrast to two earlier laboratory studies on bomb disposal operators. Further analysis revealed that the paratroopers showed low cardiac responsiveness to stress in contrast to non-decorated bomb disposal operators, but similar to the decorated bomb disposal operators.

Novice paratroopers who were undergoing parachute training were found to correspond to definitions of "courageous", "fearless" and "overconfident" types. Courageous recruits were most common. It was predicted that "overconfident" recruits would be likely to perform parachute jumps unsatisfactorily in the future. More generally the parachute training course was found to be highly successful. Recruits who had initially high self-efficacy tended to have low scores on a measure of hypochondriasis and also tended to self-rate their jumping performance as having been good. Bodily sensations associated with fear prior to parachute jumping were similar to those noted in other stressful situations for other military groups, but differed from those sensations reported in a clinically anxious population.

One further study will be completed in three years time. This investigation involves prediction of performance in N.I. of bomb disposal operators from information already obtained from the laboratory stress test and psychometric scales. Is courageous performance predictable?

APpendix: Questionnaires administered during Study 4. Instructions were altered to correspond appropriately with the particular stage of training (see procedure).

Questionnaire 1

PRE(SEffSc)

Imagine that you have to parachute from an aircraft and try to assess whether you have the skills and knowledge to manage successfully. This will depend on your experience and training, but try to give a fair estimate of your skills and knowledge at the present time. Use the scale below which runs from 0 - 100. Most of the points on the scale are defined for you but you can choose a point which lies in between such as 10 or 70.

0 _____ NO SKILLS OR KNOWLEDGE FOR DEALING WITH THIS SITUATION

10 _____

20 _____ SOME DEGREE OF SKILLS AND KNOWLEDGE BUT DEFINITELY NOT ADEQUATE FOR DEALING WITH THIS SITUATION SUCCESSFULLY

30 _____

40 _____ FAIR DEGREE OF SKILLS AND KNOWLEDGE BUT NOT ADEQUATE FOR DEALING WITH THIS SITUATION SUCCESSFULLY

50 _____

60 _____ SKILLS AND KNOWLEDGE ARE JUST ABOUT ADEQUATE

70 _____

80 _____ SKILLS AND KNOWLEDGE ARE ADEQUATE

90 _____

100 _____ SKILLS AND KNOWLEDGE ARE ADEQUATE FOR DEALING WITH THIS SITUATION IN THE BEST POSSIBLE MANNER

1. Clear day, no hurry, high altitude _____
2. Clear day, no hurry, low altitude _____
3. Clear day, rushed exit, high altitude _____
4. Clear day, rushed exit, low altitude _____
5. Poor weather, no hurry, high altitude _____
6. Poor weather, no hurry, low altitude _____
7. Poor weather, rushed exit, high altitude _____
8. Poor weather, rushed exit, low altitude _____

Average _____

Questionnaire 2

PRE

Please place a mark on the lines below to show how you expect to feel. You can place a mark at any point on the line. We are interested in the amount or degree of your feelings and expectations.

During jumping practices from aircraft, I expect to feel

a)

Comple ~ly confident	moderately confident confidence	totally lacking in

b)

Not at all jittery	moderately jittery	very jittery

c)

That it is very dangerous	that it is moderately dangerous	that it is completely safe

d)

Expect to perform very well	expect to perform moderately	expect to perform poorly

e)

Very fearful	moderately fearful	not at all fearful

Questionnaire 3

PRE

H-Scale

There are no right or wrong answers to this test; just answer what is true for you. Mark your answer for each question by filling in the left-hand box if your choice is the (a) answer; fill in the middle box if your choice is the (b) answer, and fill in the right-hand box if you choose the (c) answer. The (a) answer means yes, true, very much so, and so on. The opposite answer (c) means no, false, never, and so on. The (b) is the middle answer which you should not use very often.

1. I hardly ever feel unwell and 'out of sorts'

   (a) True, I hardly ever feel out of sorts (b) In between (c) False, I often feel that way

2. Much of the time I feel sluggish and too weary to move

   (a) True (b) Partly true (c) False

3. I feel my health is rundown and I should see a doctor soon

   (a) True (b) Uncertain (c) False

4. I don't often have trouble in swallowing my food

   (a) True (b) In between (c) False, I can sometimes scarcely eat

5. I feel fit and happy

   (a) Most of the time (b) Sometimes (c) Rarely

6. I don't feel I am any worse or have more bad health than anybody else

   (a) True, I don't feel this way (b) Uncertain (c) False

7. Sometimes I feel that my nerves are going to pieces

   (a) True (b) Uncertain (c) False

8. I feel weak and ill

   (a) Most of the time (b) Sometimes (c) Practically never

9. My mind works quickly and well these days

   (a) Yes, nearly always (b) Sometimes (c) No, not at all

10. Every few days my stomach feels bloated and uncomfortable

    (a) Yes, definitely (b) A little (c) No, not at all

11. I can't keep up with daily activities because I don't feel well

    (a) True (b) Uncertain (c) False

12. I almost never feel that life is a burden

    (a) True (b) In between (c) False

Questionnaire 4

COULD YOU PLEASE RATE THE DEGREE OF FEAR YOU EXPERIENCE IN RELATION TO THE FOLLOWING ITEMS:-

	None	A little	A fair amount	Much	Very Much
Witnessing a surgical operation					
People in authority					
Crawling insects					
Sight of blood					
Looking foolish					
Doctors					
Harmless snakes					
Being stared at					
Mice					
Seeing other people injected					
Being criticised					
Bats					

Questionnaire 5

BSQ

How do you feel? (Circle the appropriate number)

	Not at all										Extremely
Face hot		0	1	2	3	4	5	6	7	8	9
Mouth dry		0	1	2	3	4	5	6	7	8	9
Ringing or buzzing in ears		0	1	2	3	4	5	6	7	8	9
Pounding or racing heart		0	1	2	3	4	5	6	7	8	9
Trembling		0	1	2	3	4	5	6	7	8	9
Numbness of skin		0	1	2	3	4	5	6	7	8	9
Blood rushing to head		0	1	2	3	4	5	6	7	8	9
Pain in chest region		0	1	2	3	4	5	6	7	8	9
Muscles twitching and jumping		0	1	2	3	4	5	6	7	8	9
Sensation of breathing heavily and deeply		0	1	2	3	4	5	6	7	8	9
Sensations from stomach (e.g. sinking, churning, 'upset')		0	1	2	3	4	5	6	7	8	9
Loss of balance (e.g. in walking)		0	1	2	3	4	5	6	7	8	9
Nausea		0	1	2	3	4	5	6	7	8	9
Headache		0	1	2	3	4	5	6	7	8	9
Hands cold		0	1	2	3	4	5	6	7	8	9
Sweating		0	1	2	3	4	5	6	7	8	9
Urge to urinate		0	1	2	3	4	5	6	7	8	9
Sensations of being close to fainting		0	1	2	3	4	5	6	7	8	9
Urge to vomit		0	1	2	3	4	5	6	7	8	9
Bowel sensations (e.g. urge to defaecate)		0	1	2	3	4	5	6	7	8	9
Muscles tense and rigid		0	1	2	3	4	5	6	7	8	9
Dizziness		0	1	2	3	4	5	6	7	8	9
Sensation of breathing shallowly and quickly		0	1	2	3	4	5	6	7	8	9
'Lump' in the throat		0	1	2	3	4	5	6	7	8	9